PB-247 566

INJURY REPORTING AND INFORMATION SYSTEM FIELD TEST. VOLUME I

D. M. J. Compton, et al

WSA, Incorporated

Prepared for:

Environmental Protection Agency

1975

DISTRIBUTED BY:

NTIS
National Technical Information Service
U. S. DEPARTMENT OF COMMERCE

BIBLIOGRAPHIC DATA SHEET

1. Report No. EPA/530/SW-110c.1

2.

PB 247 566

4. Title and Subtitle
Injury Reporting and Information System Field Test--Volume One

5. Report Date
1975

6.

7. Author(s)
D.M.J. Compton and Kelly King

8. Performing Organization Rept. No.

9. Performing Organization Name and Address
Safety Sciences
Division of WSA Inc.
San Diego, California

10. Project/Task/Work Unit No.

11. Contract/Grant No.
68-03-0231

12. Sponsoring Organization Name and Address
U.S. Environmental Protection Agency
Office of Solid Waste Management Programs
Washington, D.C. 20460

13. Type of Report & Period Covered
Final report

14.

15. Supplementary Notes

16. Abstracts

This final report, which describes a field test of an injury reporting and analysis system for the solid waste management industry, gives a comprehensive account o the development of the Injury Reporting and Information System (IRIS). The need for this system arises from the extremely high incidence and severity rates for injuries associated with this industry, and from the fact that no data are presently available which ca be used to set priorities for injury reduction programs or to monitor their success. The purpose of the field test was to design a workable injury reporting and analysis system. Data supplied by eleven public and four private solid waste agencies to the Central Data Office was collated and returned in a Quarterly Safety Management Report to each participant identified by code. This type of comparison, made possible through the use of man-hours of exposure for various activities, serves two purposes. The first is to identify the agencies with the lowest incidence rates so they may be studied to gain insight into the solutions of problems for others; the second is to monitor the success of implemented countermeasures.

17. Key Words and Document Analysis. 17a. Descriptors

*Waste Disposal, *Safety, *Accidents, *Accident Prevention, *Injuries, *Safe Handling, Materials Handling, Collection

17b. Identifiers/Open-Ended Terms

*Solid Waste Disposal

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NATIONAL TECHNICAL
INFORMATION SERVICE
US Department of Commerce
Springfield, VA. 22151

17c. COSATI Field/Group

PRICES SUBJECT TO CHANGE

18. Availability Statement

19. Security Class (This Report)
UNCLASSIFIED

20. Security Class (This Page)
UNCLASSIFIED

21. No. of Pages
140

22. Price
$6.00

349044

INJURY REPORTING AND INFORMATION SYSTEM (IRIS) FIELD TEST

VOLUMES I

This final report (SW-110c.1) describes work performed for the Federal solid waste management programs under contract No. 68-03-0231 and is reproduced as received from the contractor

Volume I describes a field test of an injury reporting and analysis system for the solid waste management industry.

Volume II contains the tabulation of data.

U.S. ENVIRONMENTAL PROTECTION AGENCY

1975

i (a)

This report as submitted by the grantee or contractor has not been technically reviewed by the U.S. Environmental Protection Agency (EPA). Publication does not signify that the contents necessarily reflect the views and policies of EPA, nor does mention of commercial products constitute endorsement or recommendation for use by the U.S. Government.

An environmental protection publication (SW-110c.2) in the solid waste management series.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the considerable help and encouragement provided during the entire course of this study by EPA staff, particularly Mr. Robert Colonna, Mr. Dan Greathouse and Ms. Cindy McLaren.

The authors would also like to thank the staff of the solid waste agencies participating in the Field Test for their patience, persistence and interest in our common goal of reducing injuries to the workers in this vital industry.

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EXECUTIVE SUMMARY

This Final Report on Contract 68-03-0231 describes a Field Test of an injury reporting and analysis system for the solid waste management industry. The need for this system arises from the extremely high injury rate in this industry (which, so far as can be determined from present data, has the highest or nearly the highest injury rate of any industry in the U.S.) and the associated high costs and other problems. No data is at present available which could be used to set priorities for injury reduction programs or monitor their success. In recognition of the need for such data, a Pilot Study was funded in 1970 under Contract CPE-70-114. This Pilot Study, conducted from June 1970 to June 1972, investigated whether the existing records held by solid waste agencies on injuries that had occurred in recent years, and on personnel employed in those years, could be used to give useful data on injuries. Through examination of approximately 3,500 injury records and 3,000 personnel files in six cities across the U.S., it was determined that the existing data could not be used to provide valid data on injuries, because it was too fragmented and did not use common definitions. Data from one solid waste agency could not be compared on any meaningful basis with data from another agency. However, the Pilot Study did identify a list of factors related to injuries that could be used as the basis for an injury reporting and analysis system, and showed that information on these factors was available if a means could be developed for collecting it.

A concept was developed for a study in which data would be collected on injuries as they happen and on employees during their employment.

The Field Test described in this report had as its purpose to further define this concept and to translate the concept into a workable injury reporting and analysis system. The goals of the system were defined as supplying data (a) to line managements of solid waste agencies that would enable them to improve their safety awareness by providing valid comparisons with the performance of other agencies, and to identify, set priorities for, and evaluate injury reduction programs; (b) to national groups responsible for setting standards for equipment and work practices in the solid waste management industry; and (c) to EPA, to enable the agency to set priorities for and monitor programs of injury control as related to productivity and work practices. These goals require the development of a system in which solid waste management agencies, referred to as participants, feed information into a central office which will analyze the information and send reports back to the participants. The need for a common system, using a central office, arises from the need to accumulate a sufficient volume of data for statistically valid conclusions to be drawn, and from the need to obtain data that is strictly comparable from one solid waste agency to another, using consistent definitions and methods.

The system developed has several novel features:

- the injuries are analyzed in terms of factors specifically applicable to the solid waste management industry

- the factors selected allow the identification of the relative hazards of various aspects of the work environment. For example, the concept of activity was used. By activity is meant the specific operation or task being performed by the injured employee at the time he was injured. By breaking up the work day into activities, the injury rate can be compared for each activity, so that the relative hazards of each activity can be examined and priorities can be set for countermeasures. In addition, by the breakdown into activities it is possible to realistically compare the injury experience of different participants by comparing the injury rates associated with performing exactly the same task.

- in order to compare various aspects of the work environment, exposure data (also referred to as basing data) are collected. These data include the man-hours at risk for various activities. For example, it is not enough to know what fraction of injuries happen to workers while carrying refuse containers. It is also necessary to know how many man-hours are spent carrying refuse containers. The injury risk (injury rate per man-hour) can then be computed and used, for example, to compare the injury experience of different solid waste agencies for workers performing this same task.

In order to collect this data, the system provides for acquiring data in three time frames. The first is at the time that a participant joins the system, when data is collected on all existing employees, all equipment, and certain key work practices (e.g., crew size, collection methods). The second is at a periodic updating of this data (monthly for employee information). The third is on each injury, as it occurs. Only the details of the injury need be collected, since data on the injured employee's age, experience, job class, etc. is already on file.

The Field Test of this system involved 15 participants. Initially, much of the data needed for start-up was collected through visits to participants by contractor staff. Visits were also paid to train participant staff in methods required for data collection and reporting. As the Field Test continued, forms and procedures were developed by which participants could collect start-up data without on-site visits by contractor personnel, and could report data on injuries without on-site training by contractor staff.

The forms and procedures developed in the Field Test were designed to meet the requirements of an Injury Reporting and Information System for Solid Waste Management (IRIS) and are described in a companion volume to this Final Report, entitled User's Manual.

Acceptance, by the 15 participants in the Field Test, of forms and procedures similar to those in the User's Manual was found to be excellent.

A variation in which injury information was telephoned to the central office, rather than sent on an Injury Report Form, was developed and tested with one participant. This variation proved to be highly successful, and should be seriously considered for use in IRIS.

During the Field Test it was found that there is ample evidence of high demand for the type of information that could be provided by IRIS, since many types of organizations requested information from the contractor.

Successful operation of the system to provide analyzed data was demonstrated. Because the Field Test was primarily directed towards examining feasibility, it was not possible to generate a large amount of analyzed data that is immediately applicable. However, some significant findings were made and are described and discussed in a companion volume to this Final Report, entitled Tabulation of Data.

The conclusion reached as a result of the Field Test is that an injury reporting and analysis system, of the type described in a companion volume as an Injury Reporting and Information System for Solid Waste Management, is feasible and that there is a need for the information that would be generated.

I. INTRODUCTION

This is the Final Report on Contract 68-03-0231, "Field Test of an Injury Reporting and Analysis System for the Solid Waste Management Industry." Work on the contract started on March 12, 1973 and was performed by ENVIRO-MED, Inc. In mid-1974, ENVIRO-MED, Inc. ceased operations and the personnel involved became associated with SAFETY SCIENCES Division of WSA Inc. The contract was novated to SAFETY SCIENCES in late 1974. Project Officers for the U. S. Environmental Protection Agency were Mr. Dan Greathouse and Ms. Cindy McLaren.

This report includes, in Section I, a brief discussion of previous work leading to the Field Test. Section II describes the procedures used in the Field Test, and Section III describes the results of the Field Test in terms of the problems encountered and the modifications made in the injury analysis and reporting system. Section IV reviews the results of the Field Test and concludes that a larger scale Injury Reporting and Information System for Solid Waste Management _is_ feasible and that there is a need for the data that would be generated.

Two other volumes accompany this Final Report. One, a _Tabulation of Data_, presents and describes some of the data on injury rates obtained as a by-product of the Field Test. The other, a _User's Manual_ for the Injury Reporting and Information System for Solid Waste Management, outlines the forms and procedures developed in the Field Test.

1.1 Background

There is abundant evidence that both the frequency and severity of injuries are very high in the solid waste management industry. The Bureau of Labor Statistics publishes annual tabulations of Injury Rates by Industry. For 1970, the last year in which municipal workers were included in this tabulation, the category "local government, refuse collection and disposal" had a higher injury frequency rate than any other industry shown. The most recent National Safety Council data, for 1973, show municipal refuse collection workers to have an injury frequency approximately ten times that of the national average for all industry. The economic cost of injuries is also large, with typical workmen's compensation insurance rates being 9-13% of payroll for refuse collectors. In California, for example, the premium rate is $10.28/$100.00 of wages for refuse collection according to the Manual for Rules, Classification & Rates for Workmen's Compensation Insurance. This places refuse collection in the high-medium range of occupations. Roofing, for example, has one of the highest rates at $16.80/$100.00, while office workers have the lowest rate of $.21/$100.00.

A number of publications discuss various aspects of the injury problem in this industry; a listing is given in the Bibliography following Section IV of this report. However, no statistical data is available that can be used as the basis for a program to introduce and evaluate injury-reducing countermeasures.

1.2 The Pilot Study

Recognizing the need for information on the injury problem that could be used as a basis for action, a contract (CPE-70-114) was funded to perform "A Pilot Study in the Field of Occupational Health in the Solid Waste Management Industry" (referred to hereafter as the Pilot Study).

The Pilot Study was performed during the period June 1970 through June 1972. A final report* was submitted in 1973. The objective of the Pilot Study was to examine the feasibility of two approaches to an eventual larger scale study: (a) a retrospective approach in which existing records held by solid waste agencies on injuries that had occurred, and personnel that had been employed, in previous years would be used to give useful data on injuries; and (b) a prospective approach, in which a data collection system would be devised, and information on injuries would be collected as they happen and information on personnel would be collected during their employment. In order to cover a range of agency characteristics, the Pilot Study was conducted in six cities: two with populations over 500,000; two with populations in the range 200,000 to 400,000; and two in the range 20,000 to 100,000. The cities selected were Washington, D.C.; San Diego, California; Des Moines, Iowa; Birmingham, Alabama; Brookline, Massachusetts; and Inglewood, California. In addition to the six main municipal solid waste agencies studied, two private agencies were studied in detail and six others in less detail.

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*A Pilot Study in the Field of Occupational Health in the Solid Waste Management Industry. Final Report on Contract CPE-70-114, ENVIRO-MED, Inc., now succeeded by SAFETY SCIENCES Division of WSA Inc., San Diego, California.

The first step of the Pilot Study was to determine what factors are relevant to a study of the injuries occurring to solid waste workers, and to assemble these factors into a framework that could interrelate them. This step was conducted by examining data on all injuries that had occurred during a four year period, in the years 1966-1970, to all sanitation workers employed by the City of San Diego. A total of 750 injuries were reviewed that had occurred to a total of 650 individual employees. Records on all employees were studied, whether or not they had been injured.

Possible factors for inclusion in an injury information system were selected. The selection of factors was based upon the extent to which collecting information about the factor was expected to throw light on the causation of injury or on preventive measures, the availability of data on that factor, and the precision with which information on the factor could be recorded. After a process of trial and error, approximately 50 factors concerning each injury, and approximately 40 factors for each employee were selected. Each factor, for example outdoor hazard, was divided into a number of categories, e.g., slippery surface, uneven surface, objects on ground, etc.

Several of the factors selected had not previously been used in injury recording and analysis systems. One such factor is operation (being performed by the injured employee at the time of injury). This refers to the specific task that he was engaged on, for example, lifting container, dumping container, descending from cab of truck, etc. Recording information on this factor enables the evaluation of the risk of injury associated with each of a series of specific tasks.

Having selected factors and the categories within each factor, the records on injuries and employees were reviewed again and information on each factor was coded for computer entry. Adjustments were made to the categories, where necessary, to enable satisfactory grouping and coding of the data. The data were then analyzed by computer for each factor in turn. For example, the factor operation was analyzed to give the number of injuries, number of days lost and total cost associated with each task. This analysis proved illuminating. For example, the operation dumping container (into the hopper of a refuse truck) proved to be responsible for 24.6% of the lost time days in San Diego, twice as much as lifting containers. Carrying full containers only accounted for 0.5% of the time lost. The four operations of mounting the step (the small platform on the side or rear of the truck), dismounting from step, traveling on step at curb speed, and traveling on step at highway speed, accounted for 20% of the days lost. These all indicate directions for injury reduction activities through a careful examination of these operations. Similarly, guiding maneuvering truck was responsible for 6% of the days lost, suggesting more attention to this task.

Another method of analysis that proved illuminating is to relate injury rate to employee characteristics, using exposure data. An example is given by the factor height. If only injury records are analyzed, it is only possible to compute that, say, half the injuries occurred to workers with height over 6 feet. This finding is not useful in itself, since it is necessary to know what fraction of the workers at risk are more than 6 feet tall. The finding would not be surprising for a basketball team, where most of the "employees at risk" are over 6 feet, but would be very surprising for a group of jockeys.

A very interesting example was provided by the factor experience. Analyzing only the injury records for San Diego showed that 55% of the total days lost were associated with employees with more than 2 years experience at the time of injury, 32% with employees with experience less than 6 months, and 13% with employees with experience 6 months to 2 years at the time of injury. In itself, this information is not useful, and it is necessary to include data on employees, specifically the extent to which employees are at risk in each of these experience groups. In order to calculate the "exposure" for each of these experience groups, the data on each employee, whether injured or not, was examined. The number of months that he had been in each experience group during the four year study period was computed. For example, if he had been hired at the start of the study period, his first 6 months would contribute 6 man months to the "less than 6 months" experience group, his next 18 months would contribute 18 man months to the "6 month to 2 years" experience group, etc. When the calculation was completed the results shown in EXHIBIT 1 were computed. The group with under 6 months experience can be seen to have an average number of injuries per man month and an average number of days lost per man month that are three times higher than the group with over 2 years experience. Results of this type are useful, since they indicate upon which groups of employees attention should be focused.

While the computer analysis was in progress, teams visited the other five cities and reviewed in detail their injury and personnel records for information on the same factors. The objective was to find out whether this information was available, how difficult it was to retrieve, and whether the information, once retrieved, could be used to compare the injury experience at one solid waste agency with that at another. In order to be comparable, data must be recorded using a consistent set of definitions, so that a particular item has the same meaning in the records in each of the solid waste agencies.

The conclusions reached on the basis of this five city study were that:

"● There is no standard injury recording format consistent with the needs of accident prevention.

The rationale and design of the present injury reporting system are aimed to meet legal and fiscal requirements, especially those for the administration of Workmen's Compensation benefits, rather than to elicit information on the causes of injuries.

Amount of Experience at Time of Injury	Man-Months at Risk	Average Number of Injuries per Man-Month	Average Days Lost per Man-Month	Average Direct Cost per Man-Month
LESS THAN SIX MONTHS	1634	.114	1.57	$39.40
SIX MONTHS TO TWO YEARS	1790	.083	.59	20.50
MORE THAN TWO YEARS	9788	.035	.46	18.30

EXHIBIT 1

Relationship Between Injury Risk and Amount of Experience at Time of Injury

> Little attention is given in these records to the cause of the injury, because "fault" is not an issue in determining eligibility for Workmen's Compensation. For similar reasons, there is no incentive for monitoring the reliability of records except to insure that the employee and the benefits are properly identified.
>
> Because the entire structure of the injury recording system is designed for purposes inconsistent for use in determining the causes of injuries, the current records cannot be easily or reliably adapted for this use.
>
> - Primary data on such essential injury factors as lost time, injury costs, and the exact nature of the injury are often never recorded or are recorded and stored in a multitude of offices and in such a piece-meal fashion as to make the data virtually unretrievable, even to those immediately involved.
> - There is presently no way to compare the injury experience from agency to agency. The wide variety in what constitutes an injury, in the time loss allowed, in the injury wage continuation policies, in the random choices made of which injuries and what data to record, and in other factors make comparisons of questionable value.
> - The inadequate recording of injury data, the isolation of management from the records that are available, the lack of standardization required to make valid multi-city comparisons, and the lack of analyses of available records (especially those on cost data), has meant that all but a few in solid waste management are unaware of the magnitude of their injury problem. It is common for management to hold the unsubstantiated view that their injury rate is not high, is comparable with other cities, and is essentially unavoidable."

It should be noted that these conclusions were reached in 1972 and based upon a review of records from 1971 and previous years, at which time OSHA regulations on recording injuries were not in effect. However, the conclusions are still, in general, valid, because most establishments use a surrogate, a Workmen's

Compensation form, in the place of the OSHA 101 (Supplementary Record of Occupational Injuries and Illnesses), and the OSHA 101 itself is generally not completed in a way that can be compared from one establishment to another. One very useful feature of the OSHA regulations, however, is the OSHA 100 Log of Occupational Injuries and Illnesses that does now provide a simple way of determining the amount of time lost for each injury, for those establishments that are subject to OSHA regulations.

The computer analyses of the San Diego data were completed, and some factors were rejected as proving not to be related to injury rate in any useful fashion, or having a relationship that was not worth the associated difficulty in data collection. For example, the personnel records in San Diego were carefully examined for evidence of personal problems, such as drinking on the job, that might be related to injury experience. It was found that employees with reprimands in their personnel records for absenteeism or tardiness, or with a history of wage garnishment, had a higher injury rate than average, while employees with a recorded history of drinking or drug problems had a lower than average injury rate. However, the finding is not sufficiently useful in injury prevention to justify the problems and difficulty associated with collecting and recording this type of data.

As a final step in the Pilot Study, the results of the five city evaluation of records were reviewed in the light of the selection made of the factors that were likely to be useful. It was concluded that, while a retrospective study using existing records would not be feasible, a prospective system, in which solid waste agencies record and report data on injuries as they happen, would be feasible.

1.3 Objectives and Elements of Prospective Study

The Pilot Study indicated that a prospective study of injuries in the solid waste management industry would be feasible and could be based upon the concepts, data collection forms and analysis methods developed during the Pilot Study.

The objectives and criteria for the prospective study were defined as follows:

(1) The injury reporting and analysis system would use a new recording system to record injuries as they occur. This system would be designed specifically for the solid waste industry, and would be prevention oriented. The recording system would be separate from all compensation oriented records.

(2) The output of analyzed information from the system would be designed to serve three main users: (a) line management of solid waste agencies and firms; (b) national groups concerned with the development of safety and equipment standards for the solid waste industry; and (c) the Office of Solid Waste Management Programs, EPA.

(3) The data provided to line management of solid waste agencies would: (a) enable them to improve their safety awareness, by providing data on the dimensions of their injury problem and on the costs associated with their injuries, and by providing information that can be used to compare their injury experience with the injury experience of other agencies; (b) enable them to select and set priorities for, implement, and evaluate injury reduction programs. To do this, the information must be highly specific and illuminate particular items of equipment or particular work practices. Examples of decisions that have been made

as a result of injury data include changes in container regulations, changes in work practice involving maneuvering vehicles, rebuilding the steps on trucks, etc; and (c) justify actions to higher management. Many actions taken to reduce injury rate involve additional costs to the agency or changes in service to the householder, and must be justified. Cost data is an important means of justifying action, for example if the cost of ankle injuries can be compared to the cost of issuing safety boots.

(4) The data provided to national groups should be statistically valid, and thus needs both the collection of data on an adequate number of injuries, and the collection of exposure data. For example, the ANSI Z245 Committee on Safety Standards for Refuse Collection and Disposal Equipment has been considering the relationship between sill height on packers and back injury rate. An experimental examination of this relationship will require not only the number of injuries associated with equipment with different sill heights, but also the number of packers of each sill height that are in use, and the number of workers dumping into each.

(5) The data provided to OSWMP would enable the office to set priorities for action, to monitor and evaluate progress in injury control, and to relate recommendations on injury control to productivity and work practices.

To meet these objectives, it is necessary to have a common or nationwide system, in which solid waste management organizations, referred to as participants, will feed information into a central office which will analyze the information and send reports back to the participants. The need for a common system, rather than a system in which each participant is provided only with the tools with which to record and analyze its own injury problem, arises from: (a) the need to obtain a large volume of data from which statistically valid conclusions can be drawn, even for comparatively rare events such as accidents involving the mechanisms of packer trucks, or from handling plastic refuse bags. The analyzed data can then be supplied to the industry at large so as to facilitate the evaluation, by management, of the effects on injuries that might be expected from various changes in equipment or practices, e.g., the replacement of metal refuse containers by plastic bags; and (b) the need to obtain data by which one participant can compare its injury experience with others and with the average. There appears to be a very large range of injury frequency and severity in solid waste agencies performing roughly similar functions, with the highest being as much as 4 times greater than the lowest. This range immediately suggests that the solid waste agencies with the worst injury records could improve their performance, and that the overall performance of the industry as a whole could be substantially improved. In order to compare data, it is obviously necessary to use consistent definitions. It is also necessary to be able to separate the effects of different work practices and conditions, e.g., one-man operation of collection vehicles, weather, plastic refuse bags, etc., when in each participant these occur in different combinations.

The elements of the prospective system include data on employees, data on injuries and data needed to compute exposure (referred to as basing data because the word exposure is often misunderstood). These can be collected from participants in three time frames:

(1) At the inception of the prospective study, when basing data can be collected together with information on the characteristics of the current employees.

(2) On a routine monthly basis, when updated information is supplied by the participants, e.g., on new hires.

(3) For each injury, as it occurs.

1.4 Need for Field Test

The Pilot Study concluded with a concept for a prospective study, but without any testing of that concept. It was concluded that a field test would be desirable before attempting to set up a larger scale prospective study using an untested method. The function of the field test is to develop the prospective study from a concept to a working system, through developing the forms and procedures required, testing their feasibility in actual field use by participant organizations, and making modifications as necessary. The need for a field test was recognized by OSWMP in the award of a contract (68-03-0231) to perform the program described in this report.

II. PROCEDURES USED FOR FIELD TEST

This section of the report describes the procedures used in the Field Test to translate the concepts developed in the Pilot Study into a workable Injury Reporting and Information System, through an iterative process which involved making continuous modifications in the data collection and analysis methods on the basis of experience gained in their use. The specific modifications developed are discussed, for each type of data, in Section III.

The development of preliminary data recording methods is discussed in Section 2.1, obtaining OMB clearance for the data collection forms in Section 2.2, the selection of participants (solid waste agencies) in Section 2.3, the visits made to participants and the start-up of the Field Test in Section 2.4, procedures for identifying and handling problems and making needed changes in the data collection methods in Section 2.5, and the formulation of requirements for computer printouts of analyzed data in Section 2.6.

2.1 Development of Preliminary Data Recording Methods

As a first step in the Field Test, preliminary data collection and recording methods were developed. These represented a "first cut" at the methods needed for a prospective study, and it was recognized that the purpose of the Field Test was specifically to alter these methods where required. The framework adopted for the preliminary data collection methods was as follows:

(1) An employee data card (EDC) to collect information on the following factors:

employee name
index (used to indicate which revision of the data card was being used, so that the computer program could use the appropriate codes, etc.)
employer number
employee social security number
date card completed
sex of employee
race of employee (optional)
  white
  black
  Spanish surname
  Indian
  Oriental
  other ____________
height of employee
weight of employee
findings on medical exams (space for up to five findings, with a year found and a code for each finding, e.g., high blood pressure)
whether this employee had had his wages garnished while in this employment
number of citations for safety violations received
number of other citations received
number of suspensions received
number of merit awards received
date hired
current job classification
date promoted to this job classification
whether employee had worked in refuse collection industry prior to being hired by this employer
department
division
immediate supervisor
education (last year of school completed)
date of birth
whether this employee had attended a safety session
whether this employee had attended a training session
whether this employee belonged to a union
whether this employee had a second job
gross salary per day to nearest $
overtime rate (e.g., time and a half = 1.5)

time period for regular shift
hours per week of regular overtime
whether this employee was working on a task system
whether this employee had worked driving a truck
    prior to being hired

This employee data card was designed to allow keypunching onto two 72 column cards.

(2) An injury report form (IRF). This provided for the entry of:

injured employee's name
an injury number (used as a reference number)
index (as for employee data card)
employer number
employee social security number (used to match
    injury to employee data)
date of injury
time of injury
day of week
hours on job that day prior to injury
site of accident (e.g., collection route, incinerator)
crew size at time of injury
whether the employee was working in his regular job
    classification at time of injury
if not, what classification
answers to certain specific questions (e.g., was the
    employee scavenging waste, under the influence
    of alcohol or drugs, engaged in horseplay, etc.)
data on other persons injured in the same accident
    (by entering injury numbers)
data on vehicles and equipment involved (by entering
    equipment numbers)
data on operation being performed at time of injury
data on part of body injured
data on injury type (e.g., burn)
accident description (e.g., struck against)
motor vehicle accident information
data on protective clothing
data on outdoor hazards
data on hazardous characteristics of waste

Some of these factors required a simple numerical answer, e.g., hours on job that day prior to injury. Others had a number of categories and subcategories. An example, for the factor operation being performed at time of injury, is given in EXHIBIT 2. The IRF provided for keypunching onto seven 72 column cards.

OPERATION BEING PERFORMED AT TIME OF INJURY

Please mark an "X" in the appropriate boxes to describe the operation being performed at the time of injury. Review all boxes carefully since more than one may apply.

Handling Materials

- 8 ☐ CARRYING
- 9 ☐ DUMPING
- 10 ☐ THROWING
- 11 ☐ CATCHING
- 12 ☐ SHOVING/PUSHING
- 13 ☐ LIFTING
  - 14 ☐ Furniture, Appliances
  - 15 ☐ Shrubbery
  - 16 ☐ Bin (________ gals)
  - 17 ☐ Oil Drum
  - 18 ☐ Plastic Bags
  - 19 ☐ Other ____________________ (please list)

Containers

- 20 ☐ Standard Container(s) (________ gals)
- 21 ☐ Nonstandard Container(s)
- 22 ☐ More Than One Container
- 23 ☐ Intermediate Container
- 24 ☐ Other ____________________ (please list)

Was the Container?

- 25 ☐ full
- 26 ☐ empty
- 27 ☐ overweight (over ________ lbs)
- 28 ☐ oversized (over ________ gals)
- 29 ☐ slippery, wet
- 30 ☐ tightly packed
- 31 ☐ protruding waste
- 32 ☐ ragged edges
- 33 ☐ broken, missing handles
- 34 ☐ other ____________________ (please list)

Yes 35 ☐ No 36 ☐ Was a co-worker helping the injured employee at the time of the injury?

- 37 ☐ STANDING OR WALKING, NOT CARRYING
- 38 ☐ PUSHING WASTE INTO CONTAINER
- 39 ☐ PUSHING WASTE INTO HOPPER BED
- 40 ☐ OPERATING MACHINERY AND EQUIPMENT
  - 41 ☐ Truck Packing Mechanism
  - 42 ☐ Truck Tailgate
  - 43 ☐ Crane
  - 44 ☐ Hoist
  - 45 ☐ Compactor
  - 46 ☐ Vacuum Hose
  - 47 ☐ Caterpillar
  - 48 ☐ Forklift
  - 49 ☐ Bulldozer
  - 50 ☐ Street Sweeper
  - 51 ☐ Scraper
  - 52 ☐ Hand Tools
  - 53 ☐ Other ____________________ (please list)

Yes 54 ☐ No 55 ☐ Was the machinery or equipment broken or malfunctioning?

- 56 ☐ DISMOUNTING
- 57 ☐ MOUNTING
  - 58 ☐ Stationary Vehicle or Equipment
  - 59 ☐ Moving Vehicle or Equipment
    - 60 ☐ from running board
    - 61 ☐ from step
    - 62 ☐ from cab
    - 63 ☐ from back of truck
    - 64 ☐ other ____________________ (please list)

Yes 65 ☐ No 66 ☐ Was the vehicle or equipment broken or malfunctioning?

73	I
74	N
75	J
76	U
77	R
78	Y
79	
80	2

EXHIBIT 2

Operation Being Performed Section of the Injury Report Form Rev. 4-4/73

OPERATION BEING PERFORMED AT TIME OF INJURY (con't)

- 8 ☐ DRIVING
  - 9 ☐ At Curb Speed
  - 10 ☐ At Full Speed
    - 11 ☐ packer truck
    - 12 ☐ pickup
    - 13 ☐ automobile
    - 14 ☐ three-wheeled vehicle
    - 15 ☐ other ______________ (please list)

Yes 16 ☐ Was the vehicle broken or malfunctioning?
No 17 ☐

- 18 ☐ RIDING
  - 19 ☐ At Curb Speed
  - 20 ☐ At Full Speed
    - 21 ☐ on running board
    - 22 ☐ on step
    - 23 ☐ in cab
    - 24 ☐ in hopper
    - 25 ☐ in truck bed
    - 26 ☐ other ______________ (please list)

Yes 27 ☐ Was this part of the vehicle broken?
No 28 ☐

- 29 ☐ CLIMBING
  - 30 ☐ Tree
  - 31 ☐ Fence
  - 32 ☐ Ladder
  - 33 Other ______________ (please list)

- 34 ☐ EMPTYING TRUCK
  - 35 ☐ At Landfill
  - 36 ☐ At Incinerator
  - 37 ☐ At Transfer Station
  - 38 ☐ Other ______________ (please list)

- 39 ☐ SCHEDULED MAINTENANCE
- 40 ☐ UNSCHEDULED MAINTENANCE
  - 41 ☐ Chassis
  - 42 ☐ Engine
  - 43 ☐ Tire(s)
  - 44 ☐ Packing Mechanism
  - 45 ☐ Pulley Mechanism
  - 46 ☐ Other ______________ (please list)

- 47 ☐ CLEANING AND CLEARING
- 48 ☐ DISINFECTING
  - 49 ☐ Walkways
  - 50 ☐ Driveways
  - 51 ☐ Hopper Bed
  - 52 ☐ Truck Bed
  - 53 ☐ Incinerator Platform
  - 54 ☐ Combustion Chamber
  - 55 ☐ Other ______________ (please list)

- 56 ☐ MISCELLANEOUS INCINERATOR OPERATIONS
  - 57 ☐ Firing Furnace
  - 58 ☐ Knocking Ashes
  - 59 ☐ Stoking Furnace
  - 60 ☐ Shoveling Ashes
  - 61 ☐ Placing Grates in Furnace
  - 62 ☐ Laying Bricks
  - 63 ☐ Other ______________ (please list)

- 64 ☐ MISCELLANEOUS YARD WORK
- 65 ☐ CLERICAL/OFFICE WORK
- 66 ☐ OTHER ______________ (please list)

73	I
74	N
75	J
76	U
77	R
78	Y
79	
80	3

(3) A weekly data sheet for cost and days lost data. This provided for recording, on a weekly basis, the following data on each injury:

medical expenses ($)
days lost without compensation
days lost charged to workmen's compensation
workmen's compensation payments
days lost charged to injury leave
payments charged to injury leave
number of days lost (due to injury) charged to
    sick leave
payments charged to sick leave
number of days lost (due to injury) charged to
    vacation leave
payments charged to vacation leave
number of days lost (due to injury) charged to
    disability insurance
payments charged to disability insurance
whether this case was now closed
whether the injury, as of that date, was considered to be:
    first aid only
    medical only
    lost time, temporary disability
    lost time, permanent disability
    fatal
permanent disability benefit, if any
death benefit, if any

(4) Equipment identification basing data. Each piece of equipment (e.g., packer truck) was assigned an identifying number (usually the participant's vehicle or equipment number), and the make, model, type, year, date purchased, maintenance schedule was recorded. Codes were used to identify equipment type.

(5) Weekly update sheet. This was used to report terminations, new hires, changes of job classification for employees, and changes in equipment being used.

2.2 Obtaining OMB Clearance

Under the Federal Reports Act, OMB clearance was required for the forms used to collect data in this study. The extent of cooperation with other agencies was documented through meetings with the Occupational Safety and Health Administration, the National Institute of Occupational Safety and Health and the Bureau of Labor Statistics. Contacts were also made with the National League of Cities, the U.S. Conference of Mayors, the Council for State Government, the Institute for Solid Waste of the American Public Works Association, the National Solid Waste Management Association, and the National Safety Council. As a result of these meetings, a number of specific data items were suggested for inclusion in the study together with some changes in the data collection forms. The forms were modified and submitted for OMB clearance together with a clearance request and a supporting statement. Clearance was received with the issue of OMB No. 158-S73007 (expiring 8/31/75).

2.3 Selection of Participants

The Field Test specifications called for test by 15 participants, located in a range of geographical areas of the U.S., including both large and small organizations, and including both private collectors and municipalities. Selection of potential participants to contact was made with the advice and active assistance of the OSWMP Project Officer.

An initial list of potential contacts was made up that included the participants in the Pilot Study and certain large solid waste agencies that were active in the OSWMP COLMIS management information system. Information on the Field Test was sent to trade journals and for distribution at seminars on safety conducted by the National Solid Waste Management Association and by the American Public Works Association.

The effort to contact potential participants started at the 1973 International Refuse Equipment Show and Congress, held in Miami Beach and attended by representatives of solid waste agencies from all parts of the U.S. Initially, contacts were made with substantially more than 15 potential participants, because it was expected that only a small fraction of those approached would be willing to participate in the Field Test. Appointments were made with a first group of potential participants for presentations, at which contractor and OSWMP staff could describe the Field Test. It was found that all of the potential participants contacted expressed a high degree of interest in participating in the Field Test. Accordingly, the approach to making contact with potential participants was changed, in that it was assumed that each presentation made would have a high probability of yielding a potential participant, so that few "extra" presentations were made.

At the presentations, the objectives of the Field Test were discussed and the data collection methods were reviewed in detail. It was made clear that contractor personnel would take over the considerable burden of collecting the initial data on current employees and recording the basing data and that, to do this, access to personnel files and some clerical support would be needed. The staff of the participant would be responsible for completing the injury records and the updates on injury costs, personnel changes and equipment changes.

In general, the participant staff members attending each presentation were not able to give an immediate firm commitment to participate on behalf of their organization. The decision usually had to be formally cleared by higher management, e.g., the city attorney, the city council or the head office of a group of private collectors. A formal written request to participate, describing the study, was thus prepared and sent to each participant where the presentation had resulted in an expression of interest.

At many of the presentations, requests were made for specific changes in the data collection forms and methods, to meet local needs and interests. Some of these changes were incorporated in the system as a whole, i.e., in the forms to be used by all participants. Other changes were incorporated only into the forms for that particular participant. These participant-specific changes were of two types. One was the omission of unnecessary items. For example, questions regarding snow were removed from forms used by Southern California participants, and questions regarding incinerators were removed from the forms to be used by those agencies not operating incinerators. The second was the use of local terms, such as tub for intermediate container, and specific locations and route numbers, so that injuries could be analyzed by route. This analysis by route is, of course, not of value to the system as a whole but is of value to the participant and a decision was thus made to include such participant-specific items in the data collection methods.

As a result of the presentations, approximately 25 solid waste agencies indicated interest. This was more than could be accommodated within the scope of the Field Test. Some, in regions of the country where there were an excess of potential participants, were notified that they could not be accepted for participation. Some dropped out because they were unable to obtain clearance from the city or other authorities or because this clearance was very long delayed (one large city finally obtained clearance but too late to participate). Eighteen were initially chosen for participation to ensure that there would be at least the 15 required participants throughout the Field Test. One of these 18 dropped out of the Field Test after about 10 months because of a change in management. Because of a lack of funds, the two remaining extra participants of least value to the Field Test were cut at the time the contract was novated. One of these two had failed to start completing Injury Report Forms, although they still intended to. The other had been delaying starting because of management problems and staff shortages. Details on the final roster of 15 participants are given in EXHIBIT 3.

Participant Number	Municipal=M Private=P	Geographical Area of U.S.	Approximate Average No. of Employees	BY-Backyard CS=Curbside	Task/ 8 hour	TYPE OF SERVICE PROVIDED		Aver. Crew Size	Date of Start-Up
						Collection	Disposal		
01	M	South	700	CS	task	residential	landfill	4-man	10-73
02	M	Northeast	150	CS	8 hour	residential	incinerator/ landfill	3-man	08-73
03	M	Midwest	150	BY	task	residential	landfill	3-man	08-73
04	P	West	250	BY	task	residential/ commercial	transfer station	3-man	01-74
06	M	South	500	CS	task	residential/ commercial	landfill/ incinerator/ transfer station	3-man	10-73
08	M	North	100	BY	task	residential	transfer station	3-man	09-73
09	M	North	600	CS/BY	8 hour	residential	transfer station	3-man	08-73
10	M	West	100	CS	task	residential	landfill	3-man	09-73
11	M	Southwest	300	CS	task	residential	landfill	3-man	09-73
13	P	North	50	CS	task	residential/ commercial	landfill	2-man	01-74
14	M	Northwest	100		8 hour		transfer station/ landfill	1-man	07-73
15	M	South	400	CS	task	residential/ commercial	landfill/ incinerator	3-man	10-73
16	P	South	100	CS	8 hour	commercial	landfill	2-man	09-73
18	M	Northeast	50	CS	task	residential	landfill	3-man	09-73
19	P	North	50	CS	task	residential/ commercial	landfill	2-man	01-74

EXHIBIT 3

Details of Participants in Field Test

The acceptance of the Field Test among solid waste agencies was higher than expected. Of 40 potential participants contacted, all expressed interest. For the reasons given above, not all of these were selected for a presentation. Of the 26 presentations given, 25 resulted in an expression of further interest. From these, 18 initial participants were chosen of which only one did not follow through. The degree of acceptance of the Field Test was thus surprisingly high.

2.4 Visits to Participants and Start-Up of Field Test

A series of visits to each participant was made during the initial phases of the Field Test. As discussed above, the first visit was a presentation on the study, soliciting participation. Later visits were made:

- to make modifications in the data collection forms and methods, where necessary
- to collect basing data
- to provide training to participant staff in the completion of the injury report and other reporting forms
- to provide retraining, where necessary
- to discuss the results shown on the computer printouts

Two or more of these purposes were often combined into a single visit, but in general either three to five visits were made to each participant. This large number of visits arose in part because an interval was necessary between certain steps, e.g., after the presentation, to allow the solid waste agency sufficient time to obtain management approvals for participation, and in part because it was desired to study participant problems in depth. To the greatest extent possible, the data reported was validated by comparison, during visits, with other records held by the participant, e.g., workmen's compensation reports and the OSHA Log.

Specific problems encountered with the collection of basing data and with training are discussed in Section III of this report.

Each participant started sending in injury reports and update sheets as soon as the collection of basing data and training was complete. Participants did not all start at the same time. This was because not all were contacted at the same time, because some needed more training than others, and because some had special circumstances. For example, one participant was in the middle of moving its offices across town and requested a delay in the starting date. Because this was a private company and of considerable interest to the study, it was felt that this delay should be accommodated. The resulting starting dates are given in EXHIBIT 3.

2.5 Procedures for Identifying and Handling Problems and Needed Changes in Data Collection Methods

The heart of a Field Test of a data collection system is a systematic method of detecting problems arising from user errors and difficulties, and of identifying needs for changes, such as the inclusion of additional or different factors on the data collection forms. This section gives a brief description of the methods used for this purpose. The specific problems uncovered and changes made are described in Section III.

Problems with Injury Report Forms (IRF's) were detected and evaluated using the following procedures:

(1) The IRF was provided with a space in which the person completing the form was invited to describe the accident in detail in his own words. This provided a means of checking the multiple choice answers for correct comprehension of the question, completeness, etc. Space to answer the question "was there anything about this injury which you could not record on this form" was also provided.

(2) A log was maintained of the receipt of completed IRF's. This log allowed the sequence of injury numbers to be checked (to be sure that no IRF's had been lost). The date that each IRF was received was noted. An excessive interval during which no IRF was received was checked by a phone call to the participant and was often a sign of problems. The log also allowed recording whether cost and lost time data had been received on that injury, and whether the cost and lost time data was closed (complete) or still open.

(2) A check list for reviewing each completed IRF. This included checks for:

- Missing information (this was entered on a list of missing data to be requested from the participant).

- Questions for which the "other" box was checked. Many questions have an "other" box, followed by a line on which the participant can enter his own descriptive word or phrase as a response to the question. "Other" answers are examined to see if the choice of "other" resulted from misunderstanding the question. If so, the nature of the misunderstanding was entered in a problem log (described below) for that question. If the "other" entry was a valid additional choice to the list of possible answers provided for the question, it was entered in the "Other" Evaluation Form (described below).

- Whether all numbers and answers were entered correctly, e.g., number in the correct box, leading zeros entered (09 for September rather than 9).

- Whether answers were internally consistent, e.g., day of week between 1 and 7.

- Whether the form provided sufficient space for the answers given.

- Whether question was understood, particularly for terms such as interaction, overexertion, dermatitis and for inappropriate use of "unknown." This check was performed by comparing the multiple choice answers given with the written description of the accident also given by the participant.

- Name and social security number matching a name and social security number on an Employee Data Card.

- Equipment number matching a number on an Equipment Data Card and that the accident was compatible with this type of equipment.

- Correct injury numbers where more than one person was injured in one accident (through checking the other IRF's to see if they are consistent).

- Only one operation having been indicated, that all subjects under each operation were answered, and that the answers were consistent with the written description.

- Traffic accident section having been completed if necessary, with data consistent with written description.

- Material included in the written description of the accident that could not be entered in an appropriate place on the form. Any such material was placed on the Problems Log or "Other" Evaluation Form, together with any entry made in response to the question "was there anything about this injury that you could not record on this form."

(3) A Problems Log, which was used to list the problems encountered with each of the questions. Problems which are common to all participants were entered in one section of the Log, while problems unique to each participant were entered in a separate Log. Each problem was entered on the Log each time it occurred on a completed IRF, even if the same problem had been entered before. In this way, it was possible to monitor the frequency of occurrence of each type of problem with completing the IRF, and to devise correction action through a change in the form or through training of participant staff.

(4) An "Other" Evaluation Form. Many of the questions on the IRF provide "Other (please list)" as a possible choice for an answer. This is a necessary part of a multiple choice reporting form because it makes it possible to use a form which does not have all conceivable answers listed as choices. For example, only the commonly used pieces of equipment (or, if it is known, the most hazardous pieces) need be listed. If the injured employee were found at the time of the injury to be operating a piece of equipment not listed on the form, the person completing the form was instructed to check the box next to "Other" from among the list of pieces of equipment provided as multiple choices, and to give the name of the unlisted piece of equipment. It is necessary to monitor the answers given when "Other" is chosen for an answer because it is possible that certain choices, not initially listed, might be involved in injuries so frequently as to suggest that they should be separately listed as one of the multiple choices on the form. The "Other" Evaluation Form provided a means of recording the number of times an item was given as an "Other"

answer for a given question on a given form. Frequently occurring items were included in revisions of the form.

(5) Computer editing of data entries. As the Field Test progressed and problems encountered in the early stages were resolved, it was found possible to reduce the extent to which the IRF's were examined in detail by contractor staff, and to rely to an increasing extent on computer editing of data. Sets of new or change data cards were examined using an edit program which checks that all required data is present, that values in data fields are within preset limits, that an injury report has a corresponding social security number on an employee data report, and similar items that can be checked by a computer.

Cost and Lost Time Data was checked to determine whether cases marked closed were in fact closed, by looking for a date of return to work. The days lost (calendar and work days) were checked against a calendar and the known work schedule. The medical expenses were examined to see if they were reasonable for the type of injury, and injuries marked as first aid only were reclassified if either medical costs or days lost were indicated. The average payment for each day lost was computed and checked for each payment type (workmen's compensation, injury leave).

Time charges used under the ANSI standards for permanent disability and death (e.g., 6,000 days for a death) were computed where necessary by contractor staff and entered on sheets for keypunching.

For cases recognized as "open" a new cost and lost time data sheet was sent to the participant so as to provide for the next update. Cases indicated as closed but with dubious features were checked by telephone. Identified problems were discussed with each participant, either by telephone in the case of missing data, or by a formal on-site retraining session that proved to be the most effective method for two participants.

2.6 Formulation of Requirements for Computer Printouts

The output of the Injury Reporting and Analysis System is primarily in the form of computer printouts of analyzed data. An initial selection of the methods of reporting injury rates to be used was made on the basis of a review of other types of injury statistics reporting, including those used by the National Safety Council and the Bureau of Labor Statistics. A fundamental decision to include both ANSI (American National Standards Institute Z16.1) and OSHA standards for computing and reporting injury rates was made. This decision was consistent with a formal recommendation made by the American Public Works Association that, in the transition period between ANSI and OSHA recordkeeping standards, both systems should be used, to enable comparisons to be made with previous years in which only the ANSI standards were used. The Bureau of Labor Statistics (BLS) used the ANSI standard until 1971, and then changed to the OSHA standard. The National Safety Council (NSC) has continued to use the ANSI standard. Since the change to the OSHA standard, BLS has not reported on municipal employees, because they are not covered by Federal OSHA regulations.

States are beginning to report on injuries to municipal employees using OSHA standards, but at present the NSC publications provide the only current data on municipal employees.

The printouts are to be used by line management of solid waste agencies and by other groups as discussed in Section 1.3. To ensure that the types of analyzed data included and the forms to be used would be comprehended by and useful to each of these types of users, the printouts were reviewed by each participant, by staff of the Public Employee Section and Research Section of the National Safety Council, and by selected non-participants known to be interested in injury data in the solid waste field. As a result of comments received, modifications were made in the content and presentation of the printouts, as discussed in Section 3.7.

It should be noted that no printouts were supplied to participants until after approximately 9 months of data had been collected. This was because the forms and data collection methods were being continually revised in the first phases of the Field Test and because an insufficient number of injuries were available until that time. As soon as the data forms and methods used had become relatively stable, the whole data base collected was recoded using the revised codes and methods, and printouts could be prepared. A detailed manual on the interpretation of these printouts was sent to each participant, and to staff of the NSWMA and NSC. Comments made resulted in several alterations.

Recent printouts sent to participants have been accompanied by a detailed letter explaining what the results indicate and comparing the injury experience of that participant with others in the Field Test. For example, one recent report to participants was divided into sections:

- Comparison of OSHA Incidence rates for total recordable cases
- Comparison of overall injury rates
- Identification of the areas within that organization which have the highest rates
- Areas in which that organization is higher or lower than average
- Detailed evaluation for that organization of the injury rate associated with each activity performed by employees on the collection route
- Detailed evaluation for that organization of the location of the accident
- Detailed evaluation for that organization of injuries by age of the injured employee
- Detailed evaluation for that organization by accident type
- Detailed evaluation for that organization by injury description
- Comparison between groups of participants by operational differences

Each of these sections contained: 1) an explanatory cover sheet, 2) the participant's printouts, 3) tables comparing the participant with other types of participants for various key types of rates, 4) graphs and histograms illustrating the comparisons.

III. RESULTS OF FIELD TEST

This Section describes and discusses the results of the Field Test, in terms of the problems encountered and the changes made in the data collection and analysis methods in response to these problems. Section IV of this report discusses the overall findings of the Field Test in terms of the feasibility of a national solid waste injury surveillance system. The problems and responses are discussed for each element of injury information and analysis in turn: injury data in Section 3.1, time lost and cost data in Section 3.2, employee data in Section 3.3, non-employee basing data in Section 3.4, information on management practices in Section 3.5, updating methods in Section 3.6, and data analysis and reporting (printouts) in Section 3.7. Section 3.8 describes and discusses a novel approach taken to injury recording, a telephone system replacing injury reporting forms.

The data collection methods used emphasized multiple choice questions, since it had been found in the Pilot Study that open-ended questions did not elicit information that was complete or used common definitions. However, it was not desired to use a data collection system in which only coded data would be reported by the participant, i.e., the participant would be provided with a code book and would enter a code for each factor related to an injury. Completely self-coded data is impossible to check for validity and has been found in other studies to be associated with a high error rate even when using skilled coders. Each data collection form that was to be completed by participant staff therefore was designed to include verbal descriptions of each factor with boxes to check for selection of multiple choices.

The question of how much the data collection instruments should be "custom designed" for each participant ran through the entire Field Test. The plan of the Field Test was to first work with each participant to devise a data collection system suitable for use by that participant and including the factors of importance to that participant. By working with a range of participants, a set of needs for data collection and analysis systems was developed. The next step of the Field Test was to determine how and to what extent this set of systems could be combined into one standard system. The Field Test showed that one standard system could be developed and used: in this system all the data collection forms except the Injury Report Form are common to all participants. The Injury Report Form has a standard format that allows for adaptation to the needs of each participant without affecting the compatibility of data collected from different participants. The entire system is flexible and allows for future changes, e.g., the inclusion of new factors.

Initially, much of the data needed for start-up was collected through visits to participants by contractor staff. This permitted an investigation to be made of what was feasible, and was a necessary part of the Field Test. The Field Test was performed to determine feasible methods for use in a larger scale system, and, for this system to be economical, it will be necessary for participants to collect start-up data without major contractor help. A set of forms was developed during the Field Test for this purpose.

3.1 Injury Data

Injury data was collected on an Injury Report Form (IRF). This form was completed for each injury by participant staff. For smaller participants, one person was assigned this task. For larger participants, a group of persons was assigned, e.g., each foreman completed the IRF's for injuries occurring to workers that he supervised.

3.1.1 Changes in Methodology.

The following changes were made in the methods used:

(a) In the first stages of the Field Test, as each participant was added, substantial modifications were made to the IRF. These modifications reflected experience gained with previous participants, a desire to test a new idea, or items that the participant staff felt were important for that participant. The desire to use an IRF that includes a large number of factors and multiple choices, and hence can give very specific results, conflicts with the desire to keep the IRF down to a manageable length.

Preparing "custom designed" IRF's for each participant helps resolve this conflict by enabling inapplicable choices to be omitted. For example, questions regarding incinerators need not be included on IRF's used by participants that did not operate incinerators.

Conversely, the areas that are of interest to the participant can be covered in adequate detail. Further, the specific terms used by each participant can be used on the IRF used by that participant. Some items of data are not of value to the system as a whole but may be of value to an individual participant, e.g., on which specific route an injury occurred, so that the participant can compare the injury experience on different routes. Finally, having a custom designed IRF stimulated interest in the Field Test.

It should be emphasized that great efforts were taken to maintain comparability of the IRF's even though they were "custom designed." For items, such as factors related to incinerators, that were included on some forms, it was intended that comparisons be made only between the applicable participants. Where one topic was treated in detail for some participants and not others, careful attention was given to selecting general categories which could be used during comparisons among all participants. For example, the categories 1-5 yd., 15-20 yd., and 35-40 yd. were used for bulk containers for those participants using bulk containers for most of their operations, and where a breakdown into sizes appeared to be useful. For participants using bulk containers only infrequently, only bulk container (with no breakdown) was included on the IRF. Comparisons could thus be made within size classes for the first type of participant, while permitting comparisons to be made among all participants of injuries associated with the use of bulk containers. In addition, different terms having the same meaning could be grouped under one name (i.e., computer code) and comparisons could thereby be made, without interference from differences in terminology.

The initial use of the custom designed IRF's caused some difficulty in writing programs for computer analysis, since the first step in analyzing the data on an IRF had to be to translate, by computer, each completed IRF into a standard format in which each item was represented by a fixed card image, column number, and code. Translation instructions had to be developed for the IRF used by each participant. After experience had been gained with the first 12 participants, it was found possible to develop a master set of injury data requirements that could be used to generate a custom form for a new participant by simply omitting the items not required. All of the items in the master set had a specific identification for use in computer analysis, so that no translation was necessary. For example, the master set contains a list of approximately 25 types of collection crews, each with a standard code. The participant chooses the crew types that are applicable to his organization, and only these crew types are included, together with their standard code numbers, on the IRF for that participant. An example is shown in item 8 in the general information section of a sample IRF shown as EXHIBIT 4. It can be seen that only codes 11, 16, 17, and 51 are included. The sample IRF shown in EXHIBIT 4 represents an IRF developed using the master set concept and custom designed for a hypothetical small or medium sized municipal solid waste agency engaged in residential collection and landfill disposal, and is included for illustrative purposes.

The feasibility of the master set concept was validated by its use in developing custom designed IRF's for the last two participants to join the Field Test. No difficulty was encountered.

The later stages of the Field Test demonstrated that it was unnecessary to retain the concept of having each participant use the local terminology for each item. During the revision of IRF's associated with the wide adoption of the master set concept it was found that participants had no difficulty with the use of standard terms. For example, the term bulky item crew was readily accepted by management and recognized by the foreman completing the IRF's, even though the local term was on-call crew, will-call crew, etc.

A modification was made in the method used to record data on items that were only relevant to one participant, e.g., a particular route or landfill. Initially, all such items were listed by name on the form. As a result of the Field Test, space was provided on the form for the participant to enter a code that identifies the particular route, etc. An example is given in item 7 of the general information section of EXHIBIT 4.

The status of the master set at the close of the Field Test is believed to be such as to accommodate most potential participants. It should be noted, however, that the concept is flexible. If, for example, a new

SANITATION DEPARTMENT
OF
YOUR CITY

INJURY REPORT FORM

FOR THE

INJURY REPORTING AND INFORMATION SYSTEM

Developed For
U.S. Environmental Protection Agency
Office of Solid Waste Management Programs

Name of Injured Employee ______________________

Name of Person Completing This Form ______________________

Date of Injury ______________________

Title ______________________

Date ______________________

Injured Employee's Immediate Supervisor ______________________

☐☐☐☐☐ - ☐☐☐☐☐☐☐☐
Injury Number - Employer Number

SS-IRIS(IRF)-Rev. 1 (5/75)

EXHIBIT 4

INSTRUCTIONS

1. This Injury Report Form is designed to describe an injury by dividing the description into parts. Each section covers a particular part of the injury. When completing a section, only give information relevant to the injury being covered in that section. There are ten sections to this Injury Report Form:

    - General Information
    - Accident Description (e.g., fall, insect bite, etc.)
    - Part of Body Injured
    - Injury Description (e.g., cut, fracture, etc.)
    - Protective Clothing Being Worn
    - Characteristics of the Waste (i.e., that's being handled)
    - Activity Description (i.e., what the injured employee was doing when he was injured)
    - Outdoor Conditions (at the time of the injury)
    - Recommended Action
    - Written Description

2. Be as specific in your answers as possible.

3. Most questions refer only to the injured employee and only to the time at which he was injured.

4. For all questions
    EITHER: Circle the numbers next to the best provided answer.
    OR: Give the numerical answer requested in the boxes provided.
    OR: Check the best provided answer(s).

5. For the questions which ask for numerical answers, complete all boxes. If there are more boxes than required for your answer, place zero(s) in front of your answer.

    Example: September = $\boxed{0}\boxed{9}$, not $\boxed{9}\boxed{}$

6. Disregard the boxed numbers at the top and bottom of the form and the letter numbers to the right side of your answers (e.g., "cc 1-6"). These numbers are used for processing only.

7. The directions to the individual questions or sections of the Injury Report Form indicate whether one, or more than one, answer is permissible. DO NOT check more than one box unless you are specifically instructed that this is permissible.

8. Please read the directions on each page carefully.

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☐☐☐☐☐
Injury No.

GENERAL INFORMATION

1. Date of Injury ☐☐ ☐☐ ☐☐ (no. day yr.)

2. Injured Employee's Social Security Number ☐☐☐ ☐☐ ☐☐☐☐

3. Time of the Injury ☐☐ ☐☐ (hr. min.)
   1 am
   2 pm

4. Day of Week (Sun. = 1, Mon. = 2, etc.) ☐

5. Number of hours on job prior to the injury (on day of accident) ☐☐.☐ (list in ½ hour increments)

6. What district does the injured employee work out of? ☐☐ (your no.)

7. Type of accident site: (circle one)
   1 To/From Route
   2 Residential Route ☐☐☐☐ No.
   5 Landfill ☐☐☐☐ No.
   ______________ name
   7 Garage ☐☐☐☐ No.
   ______________ name
   8 Office & Yard ☐☐☐☐ No.
   ______________ name
   9 Other ______________ (please list)

8. What crew was the employee working on? (if applicable, circle one)
   11 Rear-End Loader Manual Collection Crew
   16 Brush Collection Only Crew
   17 Bulky Item Crew
   51 Street Cleaning Crew

9. Crew size at time of injury (if applicable) ☐

10. Did the accident occur in: (if applicable)
   1 an alley
   2 a dead end-alley
   3 a dead-end street
   4 a one-way street
   9 Unkrown/Not applicable

10. Type of collection site (if applicable):
   1 House
   2 Apartments
   4 Public Institutions
   5 Hospital/Doctor's Office
   9 Other ______________ (please list)

11. Was the injured employee working at his regular job at the time of the injury?
   1 Yes
   2 No

   If not, give temporary job title. ☐☐☐☐☐☐
   ______________ (please list)

12. Was the injured employee being trained at the time of the injury?
   1 Yes
   2 No
   3 Unknown/Not Applicable

13. Did the injury involve the combined actions of more than one worker? (e.g., two employees lifting a container together; a driver accelerates as helper tries to mount step, etc.)
   1 Yes
   2 No
   3 Unknown/Not Applicable

14. Was the packing mechanism operating at the time of the injury? (if applicable)
   1 Yes
   2 No
   3 Unknown/Not Applicable

15. List identification codes for all equipment and vehicles that injured the employee or were in use at the time of the accident.
   ☐☐☐☐☐☐
   ☐☐☐☐☐☐

16. Indicate if any of these were involved. (Check any that apply)
   ☐ Horseplay
   ☐ Haste, hurry, speed
   ☐ Alcohol, drugs
   ☐ Scavenging in waste
   ☐ Reaction to avoid sudden danger
   ☐ Fatigue
   ☐ Distraction

☐☐☐☐☐☐☐☐ R ☐

ACCIDENT DESCRIPTION:

Check in Column A the accident type corresponding to the to the accident inflicting injury., For injuries involving accident type in both Columns A and B.

Example: Employee fell from step and hit head on pavement. Check "Fall to a Different Level" in Column A and "Struck Against Object" in Column B.

	A First Accident	B Accident Inflicting Injury	
see 1	____	____	Traffic Accident
see 2	____	____	Struck By Vehicle or Vehicle Part
	____	____	Struck Against Vehicle
see 3	____	____	Foreign Object in Eye
	____	____	Hurt by Objects Being Handled
	____	____	Struck by Object (Except Vehicle)
	____	____	Struck Against Object (Except Vehicle)
see 4	____	____	Fall to the Same Level
	____	____	Stumble, Trip, Slip, Loss of Balance (i.e., Without Falling)
see 5	____	____	Fall to a Different Level
see 6	____	____	Caught in Something
	____	____	Caught Between Two Objects
see 7	____	____	Explosion or Fire
	____	____	Overexertion (e.g., Accident Occurred While Lifting)
	____	____	Bodily Motion (e.g., Jerking Away)
	____	____	Dermatitis (e.g., Skin Rash)
	____	____	Insect Bite, Sting
	____	____	Animal Bite, Scratch (Dog, Cat, etc.)
	____	____	Rodent Bite, Scratch
	____	____	Stepped on Sharp Object (Nails, etc.)
	____	____	Inhale, Swallow or Come in Contact with Toxic Substance (Please list substance if known) ____________
	____	____	Burn from Chemical (Please list chemical if known) ____________
	____	____	Burn or Scald From Heat
	____	____	Result of Aggressive Act (e.g., being deliberately punched by someone)
	____	____	Cave In
	____	____	No Specific or Single Event Can be Identified as the Cause of the Injury (e.g., back strain that developed gradually)
	____	____	Other ____________ (please list)

If you checked one of the items marked 1, 2, 3, . . . 7 in Columns A and B, see the section with the same number. Answer all questions in this section. DO NOT answer any other sections.

1 ☐ TRAFFIC ACCIDENT

Where was injured employee?

____ On the curb nearest the vehicle being used
____ On the curb opposite the vehicle being used
____ In the street but next to the curb
____ In the middle of the street
____ In employer's yard or disposal site
____ In cab of vehicle
____ In truck bed of vehicle
____ On step of vehicle
____ Other ____________ (please list)

2 ☐ STRUCK BY VEHICLE OR VEHICLE PART
☐ STRUCK AGAINST VEHICLE

Which Part? (Check one)

____ Entire vehicle
____ Windshield
____ Cab of vehicle
____ Cab door
____ Side of vehicle
____ Back of vehicle
____ Truck hood
____ Edge of hopper
____ Blade of packer
____ Reardoor of packer
____ Step of packer
____ Lifting mechanism
____ Other ____________ (please list)

Was the vehicle: (Check one)

____ Moving forward at curb speed
____ Moving forward at regular speed
____ Moving forward at highway speed
____ Backing
____ Not moving

WHAT TYPE OF ACCIDENT OCCURRED?

first event, and in Column B that accident type corresponding
only one accident type (e.g., insect bite) check the same

3
☐ FOREIGN OBJECT IN EYE
☐ HURT BY OBJECTS BEING HANDLED
☐ STRUCK BY OBJECT (Except Vehicle)
☐ STRUCK AGAINST OBJECT (Except Vehicle)

What was the object? (Check one)

___ Container
___ Dust, ashes
___ Fellow worker (unintentionally)
___ Garage door
___ Fences, gates, etc.
___ Walls, beams, etc.
___ Log, lumber, etc.
___ Shrubbery
___ Glass
___ Hypodermic needles
___ Fluorescent bulbs
___ Other sharp object
___ Furniture, appliances
___ Hand tools
___ Noxious liquids
___ Pavement, ground
___ Other ______________________
(please list)

Was the object ejected from the hopper? (if applicable)

___ Yes
___ No

4
☐ FALL ON THE SAME LEVEL
☐ STUMBLE, TRIP, SLIP, LOSS OF BALANCE (without falling)

Was the fall: (Check all that apply)

___ On a slippery surface
___ On an uneven surface (e.g., hole in ground)
___ Over objects on ground
___ Over objects protruding from ground
___ Icy surface
___ Other ______________________
(please list)

Location of fall (Check one)

___ Landfill
___ Street/alley
___ Residential yard/driveway
___ Employer's office, yard, garage
___ Other ______________________
(please list)

5
☐ FALL TO A DIFFERENT LEVEL

Was the fall: (Check all that apply)

___ On a slippery surface
___ On an uneven surface (e.g., hole in ground)
___ Over objects on ground
___ Over objects protruding from ground
___ Icy surface
___ Other ______________________
(please list)

Location of Fall

From	To
___ Cab	___ Ground
___ Step (of vehicle)	___ Floor
___ Ladder	___ Down embankment
___ Curb	___ Onto overturned container
___ Stairs	___ Other __________ (please list)
___ Dock	
___ Other __________ (please list)	

If the fall was from a vehicle, was the vehicle: (Check one)

___ Moving forward at curb speed
___ Moving forward at regular speed
___ Moving forward at highway speed
___ Backing
___ Not moving

6
☐ CAUGHT IN
☐ CAUGHT BETWEEN

___ Packing mechanism
___ Edge of hopper and container
___ Two containers
___ Truck door
___ Wall or fence & vehicle
___ Other ______________________
(please list)

7
☐ EXPLOSION OR FIRE

Where was the fire? (Check one)

___ In container
___ In packer truck
___ At landfill
___ Other ______________________
(please list)

☐☐☐☐☐☐☐☐☐☐R2

☐☐☐☐☐
Injury No.

PART OF BODY INJURED

Circle one and only one number which best describes the part of the body injured. Circle the part most seriously injured. Use "Multiple Parts" only if several parts are injured about equally.

10 HEAD
  11 Scalp
  12 Skull
  13 Brain
  20 Face
    21 jaw
    22 cheek
    23 mouth, lip, teeth
    24 forehead
    25 nose
    26 ears
    27 eyes
    28 other ____________ (please list)
30 NECK
40 UPPER EXTREMITIES
  41 Shoulder
  42 Arm (upper/lower)
  43 Elbow
  44 Wrist
  45 Hand
  46 Fingers
  47 Thumb
  48 Other ____________ (please list)
50 TRUNK
  51 Back
  52 Abdomen
  53 Chest (Ribs)
  54 Hips
  55 Buttocks
  56 Genitalia, Groin
  57 Other ____________ (please list)
60 LOWER EXTREMITIES
  61 Leg (upper/lower)
  62 Knee
  63 Ankle
  64 Foot
  65 Toes
  66 Other ____________ (please list)
70 INTERNAL (lungs, stomach, etc.)
80 MULTIPLE PARTS INJURED

INJURY DESCRIPTION

Circle one and only one number which best describes the injury sustained. Circle the most serious injury sustained. Use "Multiple Types" only if several injuries are equally severe.

01 Amputation
02 Asphyxia, Strangulation, Drowning
03 Avulsion
04 Bite from Animal
05 Bite (Sting) from Insect
06 Blind in One Eye
07 Blind in Two Eyes
08 Bruise, Contusion, Crushing
09 Burn or Scald from Heat
10 Burn from Chemical
11 Concussion
12 Contagious, Infectious Disease
13 Cut, Laceration, Puncture
14 Dental Injury
15 Dermatitis, Rash
16 Dislocation
17 Electric Shock
18 Foreign Object in Eye
19 Fracture
20 Freezing, Frostbite, Other Low Temperature Effects
21 Hearing Impairment
22 Hearing Loss in One Ear
23 Hearing Loss in Two Ears
24 Hernia, Rupture
25 Infection
26 Inflammation of Joints, Tendons and Miscles
27 Nosebleed
28 Poisoning, Blood Poisoning
29 Scratches (Superficial), Abrasions
30 Sprain, Strain
31 Sunburn
32 Sunstroke, Heat Cramps, Heat Exhaustion
33 Systemic Disorder (e.g., Allergy)
34 Traumatic Shock
35 Multiple Types of Injury
36 Other ____________ (please list)

PROTECTIVE CLOTHING BEING WORN AT THE TIME OF INJURY

Check as many as necessary to describe the protective clothing being worn.

___ Hardhat
___ Safety Glasses
___ Goggles.
___ Ear Muffs
___ Uniform (issued clothing)
___ Gloves
___ Safety Shoes
___ Other ____________ (please list)

CHARACTERISTICS OF WASTE

Check as many as necessary to describe the type of waste being handled at the time of the injury.

___ Wet, Water Soaked
___ Rocks, Concrete Chunks, etc.
___ Dust, Ashes, Other Particles
___ Glass
___ Hypodermic Needles
___ Other Sharp Object
___ Exploding Aerosol Cans
___ Noxious Liquids
___ Shrubbery/Tree Limbs
___ Grass/Weeds/Leaves
___ Rats, Hostile Creatures
___ Dead Animals
___ Furniture, Appliances
___ Newspaper/Magazines/Other Stacked Paper
___ Cardboard Slats
___ Wood, Lumber
___ Protruding Objects, Unspecified
___ Other ____________ (please list)

☐☐☐☐☐☐☐☐☐R3

ACTIVITY DESCRIPTION

What was the injured employee doing at the time he was injured?

This page is divided into 13 sections. Each section has one or more activities which are listed in red. Most sections have questions which apply only to the activities in the section. Follow these steps to complete this page:

1. **Check ONE AND ONLY ONE red-lettered activity, which BEST describes what the injured employee was doing.**
2. **Answer all of the questions in the section which contains the activity you chose in step one.**
3. **DO NOT check more than one activity. DO NOT answer questions outside of the section containing the activity you chose.**

BE EXACT. For example, if the injured employee was "Carrying," the correct activity would be "Carrying," not "Standing, Walking."

☐ CARRYING

☐ DUMPING

☐ PUSHING/PULLING

☐ LIFTING

Was a co-worker helping the injured employee to carry, dump, throw, etc.?

___ Yes
___ No

What was being carried, dumped, thrown, etc.? (Check as many as apply)

___ Standard metal container (30 gals)
___ More than one container
___ Plastic bag(s)
___ Plastic can
___ Cardboard box
___ Intermediate container
___ Nonstandard container(s) (other than above)
___ Shrubbery - bundled
___ Shrubbery - not bundled
___ Furniture, appliances
___ Other ______________ (please list)

Was the container: (Check as many as apply)

___ Full
___ Empty
___ Overweight
___ Oversized
___ Slippery, wet
___ Tightly packed
___ One with ragged edges
___ One with broken or missing handles
___ Full of water
___ Other ______________ (please list)

☐ USING HAND TOOLS

___ Shovel, hoe, rake
___ Wrench, hammer, chisel
___ Broom
___ Power mower
___ Power saw
___ Other ______________ (please list)

Was the hand tool broken?

___ Yes
___ No

☐ GUIDING OR DIRECTING VEHICLE OR EQUIPMENT

☐ DRIVING

☐ RIDING

☐ MOUNTING

☐ DISMOUNTING

What was being driven, ridden, etc. (Check one)

___ Front-end loader
___ Rear-end loader
___ Street sweeper
___ Open body dump
___ Pickup
___ Automobile
___ Scraper
___ Compactor
___ Bulldozer
___ Other ______________ (please list)

What part of the vehicle or equipment was being driven, ridden, etc.? (Check one)

___ Cab
___ Step
___ "Tracks"
___ Running board
___ Truck Bed
___ Hopper
___ Other ______________ (please list)

Was the vehicle or equipment: (Check one)

___ Moving forward at curb speed
___ Moving forward at regular speed
___ Moving forward at highway speed
___ Backing
___ Not moving

Was any part of the vehicle broken or malfunctioning?

___ Yes
___ No

If yes, what part?

______________ (please list)

☐ WASHING

☐ CLEANING AND CLEARING

☐ DISINFECTING

What was being washed, cleaned, or disinfected? (Check one)

___ Vehicle or equipment
___ Hopper bed
___ Walkways
___ Driveways
___ Truck Bed
___ Other ______________ (please list)

☐ OPERATING PACKING MECHANISM

☐ OPERATING MACHINERY OR EQUIPMENT

What machine or piece of equipment was being operated? (Check one)

___ Rear-end packing mechanism
___ Front-end lifting mechanism
___ Rear-end lifting mechanism
___ Overhead hoist
___ Other ______________ (please list)

Was any part of the equipment or machinery broken or malfunctioning?

___ Yes
___ No

If yes, what part?

______________ (please list)

☐ EMPTYING AT LANDFILL (Not Dumping)

What was being emptied? (Check one)

___ Rear-end loader
___ Open body dump
___ Sweeper
___ Other ______________ (please list)

☐ COMPLETING OPERATOR CHECK OF VEHICLE

☐ SCHEDULED MAINTENANCE AND REPAIR

☐ UNSCHEDULED MAINTENANCE AND REPAIR

What part of the vehicle was being checked, maintained, or repaired? (Check one)

___ Chassis
___ Engine
___ Tires
___ Packing mechanism
___ Hoist and pulley mechanism
___ Other ______________ (please list)

☐ CLERICAL/OFFICE WORK

☐ STANDING OR WALKING ONLY (i.e., when not doing one of the other listed activities)

☐ NO ONE SPECIFIC ACTIVITY CAN BE IDENTIFIED AS THE REASON FOR THE INJURY (e.g., muscle strain that developed gradually)

☐ OTHER ______________ (Please list)

☐☐☐☐☐☐☐☐☐ R 4

☐☐☐☐☐
Injury No.

OUTDOOR CONDITIONS

Check as many as necessary to describe the outdoor conditions at the time of the injury.

___ Hot Weather
___ Cold Weather
___ Rain
___ Snow
___ Freezing Rain
___ High Winds
___ Darkness
___ Uneven Surfaces/Hole in Ground
___ Loose Gravel, Slag, etc. on Surface
___ Wet Grass
___ Mud
___ Icy Surfaces
___ Slippery Surfaces
Other

___ Loose Objects on Ground
___ Objects Protruding from Ground
___ Animals (Dogs, Cats)
___ Insects
___ Rodents
___ Glare
___ Excessive Noise
___ Weeds/Shrubbery/Tree Limbs
___ Poison Ivy/Poison Oak
___ Dust, Ashes in Air
___ Exhaust Fumes, Vapors
___ Posts, Fences, Walls, Gates
___ Wires, Cables, Washlines

RECOMMENDED ACTION

Check the action(s) which, in your opinion, would help avoid this accident in the future. Circle as many as apply.

___ Mark equipment with operating instructions
___ Change work methods or procedures
___ Improve method for reporting unsafe situations
___ Improve housekeeping
___ Enforcing use of personal protective clothing or equipment is a problem
___ Enforcing use of mechanical guards and safety devices is a problem
___ Individual performed task without approval of supervisor
___ Individual performed task unrelated to position qualifications
___ Provide warning device (mechanical, sound or lighted)
___ Provide protective clothing or equipment
___ Display warning decal, sign or poster
___ Provide roadway warning or protective device(s)

___ Improve vehicle maintenance
___ Improve equipment maintenance
___ Replace equipment that is inadequate for job
___ Repair or replace defective equipment
___ Add safety feature or device to equipment
___ Repair employer's walking surface
___ Hire additional employees
___ Improve employee selection process
___ Take disciplinary action against individual
___ Reassign employee to another job
___ Employee should be counseled
___ Recommend individual receive additional job-related training
___ Improve training program for new employees
___ Recommend individual attend driver training course

IN YOUR OWN WORDS, DESCRIBE THE ACCIDENT IN DETAIL. BE SURE TO INCLUDE:

(1) Any information about the accident which you could not include elsewhere in this form;
(2) The events immediately preceding the injury and those following;
(3) How the accident occurred and what injuries were sustained;
(4) What the injured employee was doing at the time he was injured; and,
(5) Any special factors which you think contributed to the injury.

____
____
____
____
____
____
____
____

☐☐☐☐☐☐☐☐☐ IR5

piece of equipment comes on the market, the piece of equipment can be easily included in the system by simply assigning it a code and including the piece of equipment on the forms of those participants buying the new pieces of equipment.

(b) The order of the sections of the IRF was changed. Initially, the sections considered most important to the study (e.g., Operation being Performed), were placed first in the form. However, it was found that the participants apparently had different ideas of what was most important and, not looking ahead in the form, would place answers to later questions in earlier sections of the form. For example, when asked what the employee was doing at the time of the injury, respondents would occasionally check "other" and write in "broke ankle." The explanation for this response is that the respondent apparently felt that this was the key relevant piece of information. By placing the questions the respondent believes to be most important first on the form, it is felt that this tendency to place answers to other sections' questions will be reduced (i.e., the respondent will have already stated that a broken ankle was involved by the time he reaches the Operations Being Performed section). Accordingly, the order of the form now generally asks the simplest and most obviously relevant questions first, i.e., part of body, injury description, etc.

(c) Many sections of the IRF had category/subcategory relationships. One of the most frequent errors found on examining completed IRF's, and that had to be corrected by contractor staff before keypunching, was a failure to recognize these relationships, even though the categories were capitalized and each set of the subcategories was indented. The simplest of these category/subcategory relationships is included in the Part of Body section (head is a category; scalp, skull, brain and face are subcategories; jaw, cheek, eyes, etc. are subcategories of face; etc.). The category/subcategory relationship was usually recognized in this section, but in the more complex sections -- namely, Operation Being Performed and Accident Description -- this relationship was very frequently not recognized. Although several faults in the form were identified as partial explanations, it was not easily apparent why this lack of recognition occurred, as the subcategories were obviously, it appeared, merely questions requiring more detail about a category. Nevertheless, many times a respondent would check a category and leave the subcategories unchecked, or would check subcategories under categories which did not apply. This type of problem with correctly completing the form had become the most frequent and most severe problem encountered in the Field Test. For this reason many changes were made in the form to improve the respondent's recognition of a category/subcategory relationship, including:

- -- improved, much more detailed, and more step-by-step instructions. The previously used instructions for the Accident Description and Operation Being Performed sections were modified to state that only one category is to be checked, that all subcategory questions under the chosen category, but only this category, are to be answered.
- -- the use of red letters to identify categories and separate them from the subcategories;
- -- drawing boxes around each category/subcategory set to make clearer which subcategories referred to which categories;
- -- putting a question before each subcategory set, where possible, which related the subcategories to one, and only one, set of categories. For example, instead of merely indenting "packer truck" under "driving, riding, mounting, or dismounting" to show that "packer truck" was to be checked only if it was being driven, ridden, mounted, or dismounted, and in no other case, the revised IRF placed "packer truck" under a question which specified the subcategories' relationship to a category, namely "What was being driven, ridden, etc.?"

These changes very greatly reduced the errors of this kind made in the sections of the form involving category/subcategory relationships, and because this type of error was by far the most frequent, the changes have greatly reduced the overall error rate. In most cases, the revised IRF's were returned with no apparent errors.

(d) In the initial stages of the Field Test, some IRF's were returned with two answers, rather than one answer, checked in the accident description section of the form. Evaluation of these forms showed that they represented a problem long faced by safety statisticians, namely, how to record an injury of the type in which a man, say, falls from a truck and strikes his head on the pavement. Is this a "fall to a different level" or "struck against" type of accident? From the standpoint of injury analysis, it is not important what happened to the employee after he fell, because what, in most cases, needs to be identified is what can be prevented, i.e., the hazard, not the outcome. For this reason, "fall" is a more relevant description of the example given than "struck against." However, it is unreasonable to expect the participant to determine which is the most important description.

This problem was resolved by introducing a place to enter details of the "first accident" and of the "accident inflicting injury."

(e) Initially, the set of instructions provided with the IRF was kept short. It was found during the Field Test that, in order to avoid errors, much more detailed and specific instructions were needed. A page of general instructions was provided, together with step-by-step instructions for each section of the form. Surprisingly enough, it was found that these longer instructions were more carefully read than the shorter instructions. A special instruction booklet was developed for training.

3.1.2 Changes in Format, Phraseology and Items Included. Production format was found to be of considerable importance in obtaining error-free use of the IRF. The IRF was made to appear smaller, while retaining most of the content of previous versions, in order to reduce the deterring effect of excessive size. The IRF was shortened by putting it into a booklet format, which used the front and back of each page and by using a smaller type face.

The use of a smaller type face made it possible to place each section of the form on one page or less. This is particularly important for the Accident Description and Activity Description sections. Previously these were on two or three pages each, and many respondents had either skipped the second and third pages or had considered them as new sections. The booklet had the name of the participant printed on the cover, which helped maintain a feeling of identification. The color of paper was changed to a pastel from white, since it had been found in discussions with the Statistics Section, National Safety Council, that the response rate for a form printed on light pastel colors was considerably greater than that for the same form in white or bright colors.

The cover of the booklet version of the IRF provides space for all the essential information needed to identify the injury, including:

- The name of the injured employee;
- The date of the injury; and
- The Injury Number and Employer Number.

The first page of the new form was devoted to instructions. The first instruction emphasizes that the Form is designed to describe an injury by dividing the description into parts and that the respondent should only provide information relevant to the aspect of the injury being covered in a particular section. The sections of the form are then listed. This instruction was included to help decrease the tendency to provide the entire description of the injury in the first section of the form.

The following changes were made in the General Information section of the IRF:

- The question concerning "interaction" was changed from "Did the injury involve interaction between the injured employee and a co-worker?," to "Did the injury involve the combined actions of more than one worker? (e.g., two employees lifting a container together; a driver accelerates as helper tries to mount step, etc.)." This change was made because few respondents have understood the meaning of "interaction."
- The question "Was the packing mechanism operating at the time of the injury?" was added. This was done in order to lessen the need to provide for two answers in the Activity Description section. Operating the packer is one of the few significant activities which is frequently going on while some other activity is being performed.

A number of "opinion" questions such as "was the injured employee involved in horseplay at the time of the injury" were merged into one question that did not tend to emphasize whether the injured employee was at fault.

The Accident Description section was altered to include traffic accidents (which had been placed in a separate section of the IRF but were found to be a rather infrequent cause of employee injuries).

The Part of Body Injured section was modified so that only one part of body (that most seriously injured) is selected. The choice Multiple Parts is to be selected only when several parts were injured to about the same extent. Previously, an amputated leg combined with a cut finger was often marked as multiple parts. A similar change was made in Injury Description.

The Characteristics of Waste section was modified extensively during the Field Test by including items frequently given as "other" and by dropping items infrequently checked. The previous title Hazards of Waste was changed because the term hazard might appear to imply that management was not controlling recognized hazards. A similar change was made from Outdoor Hazards to Outdoor Conditions.

The previous section title Operation Being Performed was changed to Activity Description, because it was frequently misunderstood.

A new section, Recommended Action, was added, providing a selection of comments on possible corrective measures.

3.1.3 Discussion. Initially, most IRF's that were completed and returned by participants contained at least one error and frequent omissions or misunderstandings of complete sections. As the Field Test progressed, the error rate fell, partly through increased experience and training of the participant staff completing the IRF's. In most cases, however, the error rate fell dramatically only after major changes made in the format of the IRF. After the production of the IRF in its booklet form, it was found that the last two participants to be added to the Field Test were able to use their IRF's without a training visit, using only the IRF's and written instructions. The error rate for these two participants was very low throughout the remainder of the Field Test.

3.2 Time Lost and Cost Data

Time lost data is essential as a measure of injury severity and cost data is of great importance in motivating and setting priorities for countermeasures. This data must be collected for each injury rather than for all injuries taken together in order to be able to compare the effects of different factors related to injuries.

3.2.1 Methodology. The following changes were made in the overall method:

(a) Initially the time lost and cost data form was individually tailored to each establishment. During the Field Test it was determined that this was not necessary. The same categories could be used by each participant with the addition of one "other benefits" category to allow for certain permanent disability benefits specific to individual participants. The final version of the Time Lost and Direct Costs form is shown in EXHIBIT 5.

(b) The Time Lost and Cost Data form was initially attached to the Injury Report Form. However, this was found to result in significant delays in returning the Injury Report Forms as cost and lost time data is seldom immediately available. The risk of losing injury data or of greatly reducing its accuracy proved to be considerably

INJURY REPORT FORM
TIME LOST AND DIRECT COSTS DATA

FOR THE
INJURY REPORTING AND INFORMATION SYSTEM

Developed For
U. S. Environmental Protection Agency
Office of Solid Waste Management Programs

Name of Establishment or City

____

Name of Injured Employee

____

Date of Injury

____

SS-IRIS(TLC)-Rev. 1 (5/75)

EXHIBIT 5

1. INJURY NUMBER

2. DATE OF INJURY

☐☐☐☐☐☐
mo. day yr.

3. AT THIS TIME, DO YOU KNOW ALL OF THE TIME LOST AND ALL THE DIRECT COSTS THAT WILL BE ASSOCIATED WITH THIS INJURY.

1 YES
2 NO
3 UNKNOWN

4. FROM WHAT YOU KNOW ABOUT THIS INJURY AT THIS TIME, IS IT A:

(Circle one only)

FIRST AID INJURY - an injury requiring no medical treatment or only one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care even though provided by a physician or registered professional personnel. 1

NONFATAL CASE WITHOUT LOST WORKDAYS - an injury that REQUIRED medical treatment administered by a physician or by a registered professional personnel under standing orders of a physician, but did not result in lost workdays, permanent disability or a fatality. 2

LOST WORKDAYS CASE - an injury that results in one or more workdays lost not including the day of the injury or day of return, but did not result in a permanent disability or a fatality. 3

PERMANENT PARTIAL DISABILITY - an injury or combination of injuries, sustained in one accident, which results in one or more of the following: (1) Amputation of all or part of: a finger, thumb, hand, toe, foot, ankle, arm, or leg; (2) Permanent impairment of function resulting in loss of sight in one or both eyes, loss of hearing in one or both ears, or an unrepaired hernia. 4

PERMANENT TOTAL DISABILITY - an injury or combination of injuries, sustained in one accident, which results in one or more of the following: (1) permanently and totally incapacitating the injured employee from following any gainful occupation; or (2) the loss of or loss of use of, both hands, both arms, both legs, both feet, both eyes, or the loss of any two of these (e.g., an eye and a foot). 5

FATALITY - an occupational injury or combination of injuries, sustained in one accident, resulting in death regardless of the length of time between the injury and the death. 6

5. DID THIS INJURY, AT ANY TIME DURING THE ACCIDENT OR THE EMPLOYEE'S RECOVERY, RESULT IN A LOSS OF CONSCIOUSNESS? (EVEN IF THE LOSS OF CONSCIOUSNESS WAS TEMPORARY AND DID NOT RESULT IN LOST WORKDAYS)

1 YES
2 NO
3 UNKNOWN

6. DID THIS INJURY, AT ANY TIME DURING THE ACCIDENT OR THE EMPLOYEE'S RECOVERY, RESULT IN RESTRICTION OF WORK OR MOTION? (EVEN IF THE RESTRICTION OF WORK OR MOTION WAS TEMPORARY AND DID NOT RESULT IN LOST WORKDAYS)

1 YES
2 NO
3 UNKNOWN

7. LIST ALL ASSOCIATED MEDICAL EXPENSES FOR THIS INJURY WHICH ARE KNOWN AS OF THE DATE THIS FORM IS COMPLETED. (ROUND TO THE NEAREST WHOLE DOLLAR.)

☐☐☐☐☐☐

LOST TIME INJURIES

8. DATE OF RETURN TO WORK (ENTER DATE OF INJURY IF NO LOST TIME; LEAVE BLANK IF NOT YET RETURNED). ☐☐ ☐☐ ☐☐
mo. day yr.

IF THE INJURY DID NOT RESULT IN ANY LOST TIME, SKIP TO NEXT PAGE.

Enter all of the lost time and direct costs associated with this injury that are known as of the date this form is completed.

Round days to the nearest whole day, and dollars to the nearest whole dollar.

Days may be entered twice (e.g., a day may be charged to both Workmen's Compensation and Injury Leave) but DO NOT DUPLICATE COSTS (e.g., if Workmen's Compensation costs are deducted from Injury Leave payments, enter either the total cost or each portion separately).

9. TOTAL NUMBER OF WORK DAYS LOST (NOT CALENDAR DAYS LOST) ☐☐☐

10. NUMBER OF DAYS LOST WITHOUT COMPENSATION ☐☐☐

11. NUMBER OF DAYS LOST COVERED BY WORKMEN'S COMPENSATION ☐☐☐

12. WORKMEN'S COMPENSATION COSTS (TEMPORARY DISABILITY ONLY) ☐☐☐☐☐

13. NUMBER OF DAYS LOST CHARGED TO INJURY LEAVE ☐☐☐

14. COSTS CHARGED TO INJURY LEAVE (EXCLUDE WORKMEN'S COMPENSATION COSTS) ☐☐☐☐☐

15. NUMBER OF DAYS LOST CHARGED TO SICK LEAVE ☐☐☐

16. COSTS CHARGED TO SICK LEAVE (EXCLUDE WORKMEN'S COMPENSATION COSTS) ☐☐☐☐☐

17. NUMBER OF DAYS LOST CHARGED TO VACATION LEAVE ☐☐☐

18. COSTS CHARGED TO VACATION LEAVE (EXCLUDE WORKMEN'S COMPENSATION COSTS) ☐☐☐☐☐

19. TOTAL COSTS FOR LOST TIME (TOTAL OF QUESTION NUMBERS 12, 14, 16, 18) ☐☐☐☐☐

☐☐☐☐☐☐☐☐TR6

INJURY NUMBER ☐☐☐☐☐

LIGHT DUTY

20. DID THE INJURED EMPLOYEE HAVE LIGHT DUTY EMPLOYMENT AFTER HIS INJURY? (ANSWER YES IF: (1) HE DID NOT HAVE ANY LOST TIME BUT HAD TO WORK AT AN EASIER JOB FOR A WHILE DUE TO THE INJURY; OR (2) HE LOST TIME AND RETURNED TO WORK AT AN "EASIER" JOB BEFORE RESUMING HIS REGULAR JOB CLASSIFICATION.)

1 YES
2 NO
3 UNKNOWN

FOR HOW MANY WORK DAYS DID THE EMPLOYEE WORK OUTSIDE HIS REGULAR JOB? ☐☐☐

PERMANENT JOB CHANGE

21. DID THE INJURY REQUIRE A PERMANENT CHANGE OF JOB CLASSIFICATION OR PERMANENT TERMINATION?

1 YES
2 NO
3 UNKNOWN

PERMANENT DISABILITY BENEFITS

(Give lump sums or the maximum allowable permanent disability payment)

22. WORKMEN'S COMPENSATION PERMANENT DISABILITY BENEFIT ☐☐☐☐☐☐
23. WORKMEN'S COMPENSATION DEATH BENEFIT ☐☐☐☐☐☐
24. OTHER ADDITIONAL BENEFITS ☐☐☐☐☐☐
25. OTHER MISCELLANEOUS COSTS PAID TO INJURED EMPLOYEE ☐☐☐☐☐☐

☐☐☐☐☐☐☐ I R 7

greater when data return was delayed. Accordingly, Injury Report Forms without Cost and Lost Time sections were sent to participants. They were asked to complete the Injury Report Forms as soon as possible after the injury, and to mail completed forms in batches, at least twice per month. A separate Costs and Lost Time form containing the employee's name, Social Security number, date of injury and Injury Number was then sent to the person responsible for the Costs and Lost Time data for the participants (often different from the person completing the other sections of the Injury Report Form). This separate form is sent at least a month after the injury occurred, and the participant is expected to complete the form at this time and indicate whether the case is still open. If it is, another Time Lost and Cost form is sent 2 months later (3 months after the injury). At this time the participant enters the cumulative time lost and costs for the injury (incremental costs were originally asked for but this proved too cumbersome). This process is repeated every 2 months until the participant indicates that the case is closed. A monthly Time Lost and Direct Costs Status update report informs the participant which cases are still open.

A method in which the Time Lost and Cost Data form was held by the participant until the case was closed and final costs could be recorded was tried during the Field Test but it was found in many cases that time lost data becomes "lost" or difficult to retrieve before cost data are complete. A typical situation is that of a municipality, which does not keep an OSHA Log of lost time, and therefore does not isolate lost time due to injuries. Attempting to retrieve this data after some months requires a review of many records (at one participant, 14 different files in five locations) to attempt to untangle time lost due to injury from days not worked for other reasons, e.g., vacation.

(c) It was found that, for several of the participants, especially private companies, direct expenses related to injuries are handled entirely by their workmen's compensation insurance carriers. Data on costs were provided to the participants at variable and sometimes long intervals, e.g., every six months. In order to obtain provisional figures for inclusion in printouts, a system was set up which provided an estimate of the wage continuation rates per day for each job classification. These rates were then used to translate days lost into direct costs, using the participants' policies for sick leave and injury leave. Note, however, that medical costs and permanent disability costs cannot be estimated in this way. These provisional costs are replaced by the final costs when the participant receives data from the insurance carriers and is able to provide a "closed" Time Lost and Cost Data form for the injury.

(d) The direct costs recorded for each injury do not include any cost of administration (whether by the participant or by the insurance carrier). For a participant covered by a workmen's compensation insurance carrier (rather than self-insured) the difference between the premiums paid in any period and the payments made by the insurance company in the same period can be very large. This difference arises in part from administration costs and other charges by the insurance company, and in part from the need to retain a portion of the premiums for the occasional very severe accident. Data was collected on the premium costs so that a running comparison could be made between premiums charged to different participants, and so that an estimate of the total burden on the industry could be made.

(e) Initially, some participants had difficulty in using the Time Lost and Cost Data form because the questions were not well grouped. A regrouping of questions and rearrangement on the page resulted in a reduction in the number of errors made, e.g., duplicate entries of costs.

(f) Two sets of standards, OSHA and ANSI, are currently used to define and record time lost. These two sets are incompatible, and, as pointed out in Section 2.6, it was initially decided to use both. Since the definitions used are complex and since the information required to classify an injury is often not known at the time the Injury Report Form is completed, questions necessary to reach decisions using OSHA and ANSI standards were included in the Time Lost and Cost Data form. For OSHA standards, questions included whether the injury resulted in loss of consciousness, restriction of motion, or temporary or permanent transfer to another job (e.g., light duty), as well as a complex set of definitions necessary to distinguish between different levels of severity, particularly between first aid cases and non-fatal cases without lost work days. For OSHA, the number of work days lost is recorded.

For the ANSI standard, calendar days lost are recorded. ANSI also uses a complex system of "time charges" for certain kinds of injuries. For example, the loss of a distal phalange of the little finger is charged as 50 calendar days lost, while the loss of the little finger up to the middle phalange is charged at 100 days lost. The first phalange of the ring finger is charged as 60 days lost, of the middle finger 75 days, and that of the index finger 100 days. These charges are used in place of the actual days lost in computing severity. It was thus necessary to provide for recording the exact details of time-charged injuries.

In the initial stages of the Field Test a simplified system of reporting and analyzing injuries was used. However, this was abandoned after discussions with the data users because the results were not compatible with either OSHA or ANSI standards. During the bulk of the Field Test, both OSHA and ANSI analyses were performed. However, the resulting complexity of data collection, processing, and especially presentation in printouts, led to the conclusion that only one system should be used. Since the OSHA system will be used in the future, the ANSI system is the one that should be dropped.

3.2.2 Discussion. The most serious problem with the collection and analysis of cost data is the "open case." The most serious injuries, with the highest cost per injury, take longest to close, i.e., to know what the final cost will be. An injury involving permanent disability may well not be closed for several years. In a prospective study, in which only the injuries occurring during the study period are included in cost data, the most serious injuries occurring in the first year of the study will not be closed until the second, third or even later years. A short term prospective study can thus give distorted results for costs unless some corrective measures are taken. The distortion of cost can be quite large. A review of approximately 10,000 workmen's compensation insurance records for public employees in the States of Oregon and California in the years 1973 and 1974 showed that a small fraction (2%) of cases not closed within one year of injury eventually contributed about 20% of the total costs. After several years of operation this problem would obviously take care of itself. In the short term, simply omitting the cost of open cases should be avoided. One solution is to use actual costs for cases up to some time limit, say one year, and, for the small number of cases still open at the end of one year, to use an estimate of the final cost. This can be obtained from the "reserve" amount assigned to each open claim by the insurance carrier. However, the reserve amount is often an overestimate and generally needs to be reduced by a factor, depending on the insurance company.

It should be noted, however, that any distortion of costs occurs only for the more serious injuries. The less serious, and more frequent, injuries are closed earlier. It is for these less serious injuries that cost data is most needed, because of the lack of appreciation by management that these injuries have high costs, e.g., that injuries associated with mounting and dismounting have an average cost of approximately $400 each. This type of cost data is accumulated rapidly in a prospective study.

3.3 Employee Data

As pointed out in Section 1.2, it is necessary to collect data on all employees to be covered by the injury information system, and not only on those injured. This employee data is collected in two time frames. One set of data is collected on those employees who are employed at the start-up date. Another set of data is collected periodically on new hires, terminations and changes in job class. These updating methods are discussed in Section 3.6.

The Field Test resulted in a number of changes to the methods and forms used to collect start-up employee data.

3.3.1 Methodological Changes.

The following changes were made in the overall methodology:

(a) At the start of the Field Test it was not clear to what extent it would be feasible for participants to collect and report the data necessary for start-up. In order to investigate this feasibility, the collection of start-up employee was organized, and in most cases performed, by contractor personnel. Initially, this was performed by a review of the participants' records by contractor personnel assisted by participant staff. This process proved to be very time consuming and difficult, because the records were incomplete, misfiled and lacking information that was supposed to be there. Other problems arose because information initially sought for the Field Test was not recorded by many participants. Some participants maintained virtually no personnel records. To collect start-up employee data from participants with minimal personnel records, a form was devised that could be circulated to each current employee, to be completed by the employee himself (with help from a foreman if necessary). Some participants were enthusiastic about the use of this type of form because it gave them, for the first time, a base of data on their employees. The collection of start-up employee data through the use of a form completed by each employee proved to be very successful where used, and it was concluded that this is the preferred method to be used in the future. A similar form is completed by new hires as a part of the updating methods, and has proved successful. The most recent revision of the Employee Information Form (formerly known as the Employee Data Card) is shown in EXHIBIT 6. This form is designed so that it could be completed by each employee, with minimum help from a foreman, and with no requirement for an accompanying instruction sheet. Further, the form is suitable for all participants and does not need to be custom designed.

(b) Initially the hours of exposure were collected on an individual employee basis by requesting, for each employee, data on the shift worked (assigned hours or task hours), the days of week worked, and average overtime per week. This method proved to be cumbersome because it was necessary to make frequent updating reports due to change of shift or days of week worked. A number of alternative methods were explored. One involved collection of data on the initial set of employees, and using this data to project all the hours of exposure information required. This method suffered from the weakness that it is not possible to allow for changes in employment level or the distribution of employee characteristics, e.g., hiring a substantial number of summer employees who are younger than average. Another weakness is that, since no data would be available on individual employees who were not among the initial set, it would be necessary to request all the standard set of data items on employee characteristics each time an employee was injured. This would greatly increase the complexity of injury reporting, and one of the prime objectives of the overall system is to avoid having to supply information on the employee each time he was injured.

A second method was therefore examined and adopted. In this method, data on hours of exposure are collected on a job classification basis, while information on the characteristics of each employee, including job classification, is collected on an individual basis. Data on hours of exposure are collected on a Job Class Basing Data form, shown in EXHIBIT 7, that is used to

EMPLOYEE INFORMATION FORM

1. EMPLOYEE NAME (Last name, first and middle initials) ____________________, ___ ___ Last Name / Initials

2. SOCIAL SECURITY NUMBER ___ ___ ___ - ___ ___ - ___ ___ ___ ___

3. SEX (Please circle one)
   1 MALE
   2 FEMALE

4. DATE OF BIRTH (Example: Sept. 1931 = 09 31) ___ mo. ___ yr.

5. RACE (Circle one)
   1 WHITE
   2 BLACK
   3 SPANISH
   4 INDIAN
   5 ORIENTAL
   6 CHOOSE NOT TO ANSWER
   7 OTHER

6. HEIGHT/WEIGHT (Example: 5 02 097) ___ ft. ___ inches ___ pounds

7. LAST YEAR OF SCHOOL COMPLETED (e.g., 9th grade = 09, 2 yrs. college = 14) ___

8. HAVE YOU EVER WORKED IN REFUSE COLLECTION OR DISPOSAL BEFORE COMING TO WORK FOR YOUR CURRENT EMPLOYER? (Circle one)
   1 YES
   2 NO

9. DATE HIRED BY CURRENT EMPLOYER (Example: 09 01 72) ___ mo. ___ day ___ yr.

10. DEPARTMENT/DIVISION/SECTION

    ____

11. CURRENT JOB TITLE

    ____

To be completed by employer

___ ___ ___ ___ ___
Standard job class code

___ ___ ___ ___ ___ ___ ___ E M

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EXHIBIT 6

JOB CLASS BASING DATA

YOUR ORGANIZATION'S JOB CLASS TITLE AND ITS STANDARD JOB CLASS CODE

COMPLETE THE FOLLOWING INFORMATION FOR AN AVERAGE EMPLOYEE IN THIS JOB CLASS.

(circle one)

1. ARE THE EMPLOYEES IN THIS JOB CLASS ON A TASK SYSTEM? 1 YES 2 NO

2. NUMBER OF WORKDAYS OF VACATION ALLOWED PER YEAR (Example: 2 weeks = 10 workdays)

3. NUMBER OF HOLIDAYS PER YEAR WHICH ARE NOT MADE UP BY WORKING AN EXTRA DAY (example: 9 days = 09)

4. ESTIMATED AVERAGE ACTUAL LEAVE DAYS TAKEN PER YEAR TO THE NEAREST DAY (E.G., SICK LEAVE, PERSONAL LEAVE, ETC.)

J1

REPEAT STANDARD JOB CLASS CODE

5. SHIFT SCHEDULE (Complete a., b., and c. for each of the shifts in this job class)

SHIFT 1

A. ACTUAL SHIFT FOR EACH DAY OF THE WEEK. Task system employees' actual shifts will probably be less than their assigned shifts. Use 24-hour clock (e.g., 1 p.m. = 1300)

	from	to
Sun.		
Mon.		
Tues.		
Wed.		
Thur.		
Fri.		
Sat.		

B. APPROXIMATE NUMBER OF HOURS OF OVERTIME PER WEEK PER EMPLOYEE. (In addition to the actual shift given above.)

C. APPROXIMATE PERCENT OF EMPLOYEES IN THIS JOB CLASS WHO WORK ON THIS SHIFT (to the nearest whole percent) %

J2

If the employees in this job class work more than one shift go on to the next page.

EXHIBIT 7

JOB CLASS BASING DATA (CONTINUED)

REPEAT STANDARD JOB CLASS CODE

SHIFT 2

A. ACTUAL SHIFT

	from	to
Sun.		
Mon.		
Tues.		
Wed.		
Thurs.		
Fri.		
Sat.		

B. OVERTIME PER WEEK

C. PERCENT OF EMPLOYEES %

J3

REPEAT STANDARD JOB CLASS CODE

SHIFT 3

A ACTUAL SHIFT

	from	to
Sun.		
Mon.		
Tues.		
Wed.		
Thurs.		
Fri.		
Sat.		

B. OVERTIME PER WEEK

C. PERCENT OF EMPLOYEES %

J4

record for an average employee in each job class, how many days are worked per month, what percentage of employees work on each shift, and what hours per day and what overtime hours are worked on each shift.

To compute an injury rate associated with an employee characteristic, the computer is programmed to perform a three step process. For example, if it is desired to compute an injury rate for all employees over 6 feet tall during a specified 6 month reporting period, the computer first examines all Injury Report Forms for injuries that occurred in this reporting period. Each such injury report is linked to an Employee Information Form, using a Social Security or other identifying number. The Employee Information Forms are then examined to determine which employees are over 6 feet tall. The number of injuries occurring to the reporting period linked to these employees then represents the number of injuries required to compute the desired rate. To compute the hours of exposure, all Employee Information Forms are examined, and each employee over 6 feet tall is identified. For each such employee, the number of months during the reporting period spent in each job class is determined. The number of man-months at risk in each job class for employees over 6 feet tall during the reporting period is then totalled. The number of hours of exposure per months for each job class is then obtained from the appropriate Job Class Basing Data form, and the total number of hours of exposure for all job classes for employees over 6 feet tall is computed. The rate is then computed as the ratio of the number of injuries per 200,000 hours of exposure, or by using some other standard method.

The advantage of this method is that only one item of employee information needs to be updated, the job class. Allowance is automatically made for seasonal employees and other variations in the work force, and only one piece of identifying data on the employee is required on the Injury Report Form. The same system yields hours of exposure data required for all other purposes, including relating injury rate to crew type and protective clothing.

(c) Initially, the job class of an employee of a participant was recorded using the title used by that participant. This procedure was found to have several disadvantages, and one of the goals adopted for the Field Test was to develop a set of standardized job classes. The disadvantages of a non-standard usage are that different participants use different job class titles for the same functions; participants use the same job class title for different functions within the organization, e.g., the title laborer is used both for an incinerator operator and for a collection worker; and, for most participants, job titles are used to distinguish different levels of pay rather than different levels of risk. To the extent possible, the job titles used by participants during the Field Test were translated by contractor personnel into standard classes. After some experimentation, a standard set of job classes was developed that can be presented to participants, so that participants can identify a standard job class that corresponds to each of their job functions. These standard job classes are based upon the Dictionary of Occupational Titles (DOT), but DOT titles in themselves were not specific enough to make distinctions appropriate for separating risk groups in the solid waste management industry. A five-digit code is used. The first two digits identify a division and section, e.g., Disposal-Landfill. The third and fourth digits identify a job type, e.g., heavy equipment operator. The fifth digit is used to distinguish between different titles used by an individual participant for the same standard (4 digit) job class code, e.g., Sanitation Crewman I and Sanitation Crewman II, two titles differing in pay but not in job function, both being residential refuse collectors (non-driver). These codes enable analysis to be made by division, section, job type (e.g., all heavy equipment operators, regardless of section), or by individual participants' job class title.

3.3.2 Items Added as Result of Field Test. The following items were added:

(a) Each employee name is entered into the computer. Initially the name was only used by contractor personnel if a mismatch was found on Social Security number. During the Field Test it became apparent that the name was needed on the computer-generated Employee Data Update List, supplied monthly to each participant, because participant staff found it too time consuming to check for possible updates when using a list which included only Social Security number.

(b) The exact date of hire, job class change, etc. Initially only the month was recorded but this caused problems with computer processing.

3.3.3 Items Omitted as a Result of Field Test. One of the major findings of the Field Test was that only a small fraction of the factors concerning employees that were included in the initial list could feasibly be included in an injury information system. Some factors were not available from many of the participants, e.g., data on findings of medical examinations. Some factors were too difficult to keep updated, e.g., sick leave usage for purposes other than injuries. Collection of data for some factors was transferred from the Employee Information Form for an individual employee, to Job Class Basing Data, e.g., shift. For other factors, most participants did not keep records for individual employees, e.g., on whether safety and training courses had been taken; whole job classes were stated to have been, or not to have been, trained and it is thus of no value to attempt to compare the accident experience of individuals with and without training. Some factors were dropped because it was not possible to obtain consistently accurate data, e.g., whether the employee held a second job. Some were dropped because they did not appear to be useful in the analysis of injury data, e.g., whether the employee belonged to a union, and the name of the employee's supervisor.

3.3.4 Discussion. Employee data was the most sensitive class of information collected in the Field Test. Union and other worker representatives expressed, in several cases, some uneasiness about the collection of data on employee age, education and race. One concern was that results showing differences in injury rates between groups of employees differing in age, race or education might be used to the detriment of one group or another. However, after some discussion it was generally agreed that data was needed and could be of value to all parties. For example, if the injury rate were found to increase rapidly with age (the opposite actually appears to be the case) this could be used as the basis for negotiating for an early retirement plan. The inclusion of race as a factor was optional, and two participants did not use it.

3.4 Non-Employee Basing Data

Basing data is collected on equipment and vehicles; protective clothing; crew type; accident site; and activity.

3.4.1 Equipment and Vehicle Basing Data. Information on the equipment in use is required in the study of injuries in order to relate injury rates to the usage of specific types of equipment and vehicles. In the Field Test each item of equipment was characterized by type, make, model, year, capacity, location of use, and maintenance schedule. Information was also collected on the average number of hours in use, the average number of tons handled, and the average number of miles driven per day. This information was collected in two time frames, at the start-up of the system by a participant, and periodically thereafter, as part of the updating methods described in Section 3.6.

In the earlier portions of the Field Test, this data was collected during a visit by contractor staff. In order to make it possible for participant staff to report this data, a standard form was developed, shown in EXHIBIT 8. Most participants have an equipment list that contains most of the data requested in this standard form, and it was found perfectly satisfactory to use the same form for all participants, with standardized codes for all items included as a list on the back of the form. The list of items of equipment included on the standard form was derived from combining the equipment lists of all participants.

During the Field Test, it was found advisable to add the following items to those originally collected: separate spaces for listing data on both chassis and packer (if only one space is allowed, data on the chassis is often entered even though data on the packer is requested and is of most interest); data on capacity; and data on sill height (this is of considerable interest because of its relationship to dumping injuries. However, the sill height of a packer depends on the type of tire used, and must be estimated individually for each packer. Make and model are not sufficient.). The following items were deleted: special characteristics (did not produce any information that could be useful); and cleaning schedule. Information on special characteristics of equipment that are related to safety (e.g., modifications to packers) are now requested as part of the Background Information referred to in Section 3.5.

EQUIPMENT/VEHICLE INFORMATION FORM

READ EACH QUESTION CAREFULLY. THE BACK OF THIS FORM LISTS ALL THE CODE NUMBERS.

2. EQUIPMENT NUMBER
Use your organization's code number. Distinguish letters and numbers carefully. Letter O = Ø Zero = O
I = I One = 1
S = S 5 = 5
Z = Z 2 = 2

3. EQUIPMENT OR VEHICLE TYPE (e.g., rear-end loader, pickup, etc. See codes on back)

4. CHASSIS DESCRIPTION

MAKE (see codes on back)

MODEL (use actual equipment only, not vehicles)

YEAR

5. PACKER DESCRIPTION

MAKE (see codes on back)

MODEL (e.g., 000028)

YEAR

CAPACITY (cubic yards)

SILL HEIGHT OF HOPPER (approx. inches)

6. DATE OF PURCHASE
(Month & Year, example 03-65)

7. TYPE OF USE
(see codes on back)

8. MAINTENANCE SCHEDULE
(see codes on back)

9. AVERAGE NO. OF HOURS IN USE PER DAY

10. AVERAGE NO. OF DAYS IN USE PER WEEK

11. AVERAGE TONS PER DAY

12. AVERAGE NO. OF MILES DRIVEN PER DAY

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E Q

EXHIBIT 8

TYPE OF EQUIPMENT CODES

01	Rear-end loader
02	Front-end loader
03	Side loader
04	Load lugger
05	Roll-off
06	Container Delivery Truck
07	Trailer (transfer truck)
08	Cushman scooter
09	Overhead crane (incinerator)
10	Equipment service truck
11	Street sweeper
12	Tow truck
13	Snow plow
14	Crew truck
15	Open body dump truck
16	Open bed truck
17	Pickup truck
18	Automobile
19	Tractor
20	Bulldozer
21	Earthmover
22	Scraper/grader
23	Forklift
24	Dragline
25	Disker
26	Tilt frame
27	Highlift
28	Crane
29	Compactor
30	Landfill spray truck
31	Water pump truck
32	Bob cat
99	Other ______________________ (please list)

MAINTENANCE SCHEDULE CODES

01	Once a day
02	Once a week
03	Twice a week
99	Other ______________________ (please list)

EQUIPMENT MAKE CODES

01	Chevrolet
02	Ford
03	Dodge
04	GMC
05	International Harvester
06	Mack
07	Allis-Chalmers
08	Leach
09	Heil
10	Easy-Pac
11	Cushman
12	Garwood
13	White
04	Master
15	Wisconsin
16	Deutz
17	Mobil
18	Wayne
19	Pelican
20	Elgin
21	Hyster
22	Diamond Reo
99	Other ______________________ (please list)

TYPES OF USE CODES

11	Residential Collection
12	Commercial Collection
31	Street Cleaning
21	Landfill Operations
22	Incinerator Operations
23	Transfer Station Operations
24	Recycling Operations
41	Office & Yard Use
51	Garage Use

3.4.2 Protective Clothing Basing Data.

In order to objectively relate injury rate to the use of protective clothing, data on the use of this clothing and other protective devices is required. The ultimate objective is to discover if workers in a particular job class suffer a greater or lower injury rate when certain protective items are used. For example, goggles may decrease the frequency of minor eye accidents but, if they interfere with peripheral vision, increase the frequency of other, more severe, accidents.

The data is collected, using a form shown in EXHIBIT 9, on a job class basis. The number of employees, and the resulting hours of exposure, in that job class are determined as described in Section 3.3.

3.4.3 Crew Type Basing Data.

A useful way of comparing injury rates between participants is to relate injury rate to collection crew type. Most injuries occur on collection routes but not all types of collection are comparable. By breaking down the collection process into different crew types, e.g., front-end loader bulk container crew, realistic comparisons can be made even between participants whose overall collection operations are not directly comparable, e.g., private vs municipal collectors.

Initially, each participant used the local name for each crew type. By reviewing all crews at all participants it was possible, during the Field Test, to prepare a list of standard

PROTECTIVE CLOTHING

IDENTIFICATION AND BASING DATA

[illegible] JOB CLASS TITLE & CODE

________________________________ ☐☐☐☐☐

YOUR ORGANIZATION'S CORRESPONDING JOB CLASS TITLE(s).

____

____

____

____

____

PLEASE COMPLETE THE FOLLOWING INFORMATION FOR THIS JOB CLASS ONLY.

Type of Protective Clothing	Is use of it Mandatory ✓ = Yes	Is it Supplied by Employer ✓ = Yes	Approximate % of this Job Class Who Normally Use It
			EXAMPLE: 50% = 050
1. HARD HAT	______	______	☐☐☐%
2. BUMP CAP	______	______	☐☐☐%
3. SAFETY GLASSES	______	______	☐☐☐%
4. GOGGLES	______	______	☐☐☐%
5. EAR PLUGS	______	______	☐☐☐%
6. EAR MUFFS	______	______	☐☐☐%
7. FACE SHIELD	______	______	☐☐☐%
8. RESPIRATOR	______	______	☐☐☐%
9. UNIFORM	______	______	☐☐☐%
10. FIRE-PROOF CLOTHING	______	______	☐☐☐%
11. TRAFFIC VEST	______	______	☐☐☐%
12. GLOVES	______	______	☐☐☐%
13. SAFETY SHOES	______	______	☐☐☐%
14. RUBBER BOOTS	______	______	☐☐☐%

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EXHIBIT 9

crew types and accompanying definitions which all participants could readily recognize. In order to collect data on hours of exposure in each crew type, the participant staff determine what standard crew type names (and codes) correspond to their crew types. For each of these crew types, they provide data on the number of crews, the job classes which make up a crew, and the number of men on each crew in each job class. This data can then be used to compute hours of exposure, since hours of exposure by job class are already available. The form developed during the Field Test for providing this data is shown in EXHIBIT 10.

3.4.4 Accident Site Basing Data. Another useful way of comparing injury data, and one very frequently requested by the management of solid waste agencies, is the use of accident site, e.g., landfill, collection route, incinerator, etc. It should be noted that there is a difference between accidents occurring to employees of the landfill division, and accidents occurring at the landfill, because many of the latter accidents will occur to employees of other divisions during their temporary presence at the landfill. In order to make these comparisons, it is necessary to compute hours of exposure at each site. During the Field Test, hours of exposure were initially computed by contractor personnel from data supplied through interviews with participant staff, and a form was later developed for use directly by participant staff. This form, shown in EXHIBIT 11, collects

CREW TYPE BASING DATA

Use your Crew Code Assignment Sheet & Job Class Code Assignment Sheet to complete the following items.

EXAMPLE: An organization has 30 Rear-End Loader Manual Collection Crews, each consisting of a 3-man crew: 1 Sen. Packer Truck Driver (non-collector), and 2 Sen. [illegible] should be completed as follows:

Rear-End Loader Manual Collection Crew	111			

Standard Crew Type	Std. Crew Code	No. of Crews	JOB CLASS(ES) IN CREW	
			Std. Job Class Code	No. on the Crew In this Job Class
Rear-End Loader Manual Collection Crew	111			
Rear-End Loader Bulk Container	112			
Front-End Loader Manual Container Crew	113			
				C1
Front-End Loader Bulk Container Crew	114			
Side Loader Crew	115			
Brush Collection Only Crew	116			
				C2

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EXHIBIT 10

Standard Crew Type	Std. Crew Code	No. of Crews	JOB CLASS(ES) IN CREW	
			Std. Job Class Code	No. on the Crew In this Job Class
Bulky Item Crew	17			
Dead Animal Crew	18			
				C3
Roll-Off Crew	21			
Load Lugger Crew	22			
Container Delivery Crew	23			
				C4
Transfer Station Crew	31			
Litter & Weed Control Crew	41			
St. Cleaning Crew	51			
				C5

Standard Crew Type	Std. Crew Code	No. of Crews	JOB CLASS(ES) IN CREW Std. Job Class Code	No. of the Crew In this Job Class
Other Type Crew	191			
Other Type Crew	192			
				C6
Other Type Crew	193			
Other Type Crew	194			
				C7
Other Type Crew	195			
				C8

ACCIDENT SITE BASING DATA BY CREW

Refer to your Crew Code Assignment Sheet for the crew types at your organization which correspond to the Standard Crew Types. ENTER ALL TIME IN MINUTES. If the times or number of trips vary greatly on different days of the week, estimate a DAILY average. For the number of trips, estimate to the nearest 10th of a trip. Some organizations have collection crews on which the collectors remain on the collection route while the driver takes the packer to the disposal site. This is the reason for dividing each type by "crewmen going to disposal," and "crewmen not going to disposal."

EXAMPLE: A rear-end loader manual collection crew is on a task system and works an average of 6.5 hours a day, for a 4 day week. It makes an average of 6 trips per week to the incinerator and 4 trips per week to the landfill. Only the driver on this 3-man crew goes to the disposal sites, the collectors continue bringing the cans to the curb. The form, in this case, should be filled out as follows (notice that the total minutes worked at all sites adds up to 390 minutes, i.e., the 6.5 hours per day worked by the crew):

R-E LOAD. MANUAL COLL.												
Crewmen going to disp.					.		.		.			111
Crewmen NOT going to disp.												111

Standard Crew Type	Number of Crewmen	Time at Office (Morn.&Eve.)	Time to & from Office & Route (per round trip)	Time to & from Route & Disposal (per round trip)	LANDFILL Aver. No. Trips (per day)	LANDFILL Time at Landfill (per trip)	INCINERATOR Aver. No. Trips (per day)	INCINERATOR Time at Incin. (per trip)	TRANSFER STATION Aver. No. Trips (per day)	TRANSFER STATION Time at Tran.Stn. (per trip)	TIME ON ROUTE (Aver. per day)	Std. Crew Code
R-E LOAD. MANUAL COLL.												
Crewmen going to disp.					.		.		.			111
Crewmen NOT going to disp.												111
R-E LOAD. BULK CONTAINER												
Crewmen going to disp.					.		.		.			112
Crewmen NOT going to disp.												112
F-E LOAD. MANUAL COLL.												S11
Crewmen going to disp.					.		.		.			113
Crewmen NOT going to disp.												113
F-E LOAD. BULK CONTAINER												
Crewmen going to disp.					.		.		.			114
Crewmen NOT going to disp.												114
												S12

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EXHIBIT 11

Standard Crew Type	Number of Crewmen	Time at Office (Morn.&Eve.)	Time to & from Office & Route (per round trip)	Time to & from Route & Disposal (per round trip)	LANDFILL		INCINERATOR		TRANSFER STATION		TIME ON ROUTE (Aver. per day)	Std. Crew Code
					Aver. No. Trips (per day)	Time at Landfill (per trip)	Aver. No. Trips (per day)	Time at Incin. (per trip)	Aver. No. Trips (per day)	Time at Tran.Stn. (per trip)		
SIDE-LOADER												
Crewmen going to disp.	☐	☐☐	☐☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐☐☐	115
Crewmen NOT going to disp.	☐	☐☐	☐☐								☐☐☐	115
BRUSH COLLECTION												
Crewmen going to disp.	☐	☐☐	☐☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐☐☐	116
Crewmen NOT going to disp.	☐	☐☐	☐☐								☐☐☐	116
BULKY ITEM										☐☐☐	☐☐☐☐	S13
Crewmen going to disp.	☐	☐☐	☐☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐☐☐	117
Crewmen NOT going to disp.	☐	☐☐	☐☐								☐☐☐	117
DEAD ANIMAL												
Crewmen going to disp.	☐	☐☐	☐☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐☐☐	118
Crewmen NOT going to disp.	☐	☐☐	☐☐								☐☐☐	119
ROLL-OFF										☐☐☐	☐☐☐☐	S10
Crewmen going to disp.	☐	☐☐	☐☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐☐☐	211
Crewmen NOT going to disp.	☐	☐☐	☐☐								☐☐☐	211
LOAD-LUGGER												
Crewmen going to disp.	☐	☐☐	☐☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐☐☐	212
Crewmen NOT going to disp.	☐	☐☐	☐☐								☐☐☐	212
										☐☐☐	☐☐☐☐	S15

Standard Crew Type	Number of Crewmen	Time at Office (Morn.&Eve.)	Time to & from Office & Route (per round trip)	Time to & from Route & Disposal (per round trip)	LANDFILL		INCINERATOR		TRANSFER STATION		TIME ON ROUTE (Aver. per day)	Std. Crew Code
					Aver. No. Trips (per day)	Time at Landfill (per trip)	Aver. No. Trips (per day)	Time at Incin. (per trip)	Aver. No. Trips (per day)	Time at Tran.Stn. (per trip)		
CONTAINER DELIVERY												
Crewmen going to disp.	☐	☐☐	☐☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐☐☐	213
Crewmen NOT going to disp.	☐	☐☐	☐☐								☐☐☐	213
TRANSFER STATION												
Crewmen going to disp.	☐	☐☐	☐☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐☐☐	311
Crewmen NOT going to disp.	☐	☐☐	☐☐								☐☐☐	311
LITTER & WEED CONTROL											☐☐☐☐☐☐☐	516
Crewmen going to disp.	☐	☐☐	☐☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐☐☐	411
Crewmen NOT going to disp.	☐	☐☐	☐☐								☐☐☐	411
STREET CLEANING												
Crewmen going to disp.	☐	☐☐	☐☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐☐☐	511
Crewmen NOT going to disp.	☐	☐☐	☐☐								☐☐☐	511
OTHER TYPE CREW											☐☐☐☐☐☐☐	517
Crewmen going to disp.	☐	☐☐	☐☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐☐☐	911
Crewmen NOT going to disp.	☐	☐☐	☐☐								☐☐☐	911
OTHER TYPE CREW												
Crewmen going to disp.	☐	☐☐	☐☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐.☐	☐☐	☐☐☐	912
Crewmen NOT going to disp.	☐	☐☐	☐☐								☐☐☐	912
											☐☐☐☐☐☐☐	518

Standard Crew Type	Number of Crewmen	Time at Office (Morn.&Eve.)	Time to & from Office & Route (per round trip)	Time to & from Route & Disposal (per round trip)	LANDFILL		INCINERATOR		TRANSFER STATION		TIME ON ROUTE (Aver. per day)	Std. Crew Code
					Aver. No. Trips (per day)	Time at Landfill (per trip)	Aver. No. Trips (per day)	Time at Incin. (per trip)	Aver. No. Trips (per day)	Time at Tran.Stn. (per trip)		
OTHER TYPE CREW												
Crewmen going to disp.					.		.		.			93
Crewmen NOT going to disp.												93
OTHER TYPE CREW												
Crewmen going to disp.					.		.		.			94
Crewmen NOT going to disp.												94
												S9
OTHER TYPE CREW												
Crewmen going to disp.												95
Crewmen NOT going to disp.												95
												S10

hours of exposure data at each site for each collection crew type. These hours are added to the hours of exposure for job classes based at each site, e.g., landfill heavy equipment operators, to give the total hours of exposure at the site.

3.4.5 Activity Basing Data. One of the most powerful ways of breaking down the work environment so that the injury experience can be compared for different aspects is the use of activity. By activity is meant the specific operation or task being performed by the injured employee at the time he was injured. By breaking up the work day into activities, the injury rate can be compared for each activity, so that the relative hazards of each activity can be examined and priorities can be set for countermeasures. In addition, by the breakdown into activities it is possible to realistically compare the injury experience of different participants by comparing the injury rates associated with performing exactly the same task. Using the concept of activity requires data on the exposure of employees to each activity. For example, refuse collectors on commercial routes do not perform as much lifting as those on residential routes. Some measure of how many lifts are performed or how many hours per day are spent in lifting is needed to compare the injury experience, associated with lifting, of these two groups.

There are two ways of assessing exposure to activities. One is on an event basis, i.e., the number of lifts or the number of times that an employee dismounts from the step of a truck. The number of such events can then be used to compute an injury rate in terms of number of lifting injuries per lift, etc. The second way is to use hours of exposure as a measure. This is most suitable for activities for which the risk of injury may be assumed to be a function of duration of exposure, i.e., carrying, riding on the step of a truck, etc.

During the Field Test, exposure to all activities was calculated on a time basis rather than on an event basis, e.g., mounting and dismounting the truck were assigned a certain time per mount and dismount, and the estimated total number of mounts and dismounts per day was used to compute the total time per day spent in dismounting and mounting activities. This choice of a time rather than an event basis was made in order to provide a consistent format for printouts. It should be noted, however, that the time assigned to an "event" activity, such as dismounting, is arbitrary and is the same for all participants. Comparisons may thus be made as if the computations were on an event basis.

Initially all activity basing data, i.e., the hours of exposure to each activity, was collected by contractor personnel through interviews with participant staff. Activity data was only collected and computed for collection crewmen. These represent the vast majority of the injuries. The methods were formalized and resulted in a basing data sheet that could be used by participants. EXHIBIT 12 shows the Daily Activity Basing Data

DAILY ACTIVITY BASING DATA

STANDARD JOB CLASS: RESIDENTIAL REFUSE COLLECTOR (non-driver)

STANDARD JOB CLASS CODE |2|1|0|5|0|

YOUR ORGANIZATION'S CORRESPONDING JOB CLASS TITLES

____

____

____

____

____

1. Number of days per week employees in this job class work (use decimals if they work part of a day, e.g., 4½ days = 4.5). |_|.|_| days

(in minutes)

2. Total ACTUAL time working per day IN MINUTES (EXCLUDE lunch, breaks, and overtime. Task system employees' ACTUAL time will be less than their assigned shift.) A. |_|_|_|

BEFORE AND AFTER ROUTE
Time spent per day at the office and yard in the following activities:

(in minutes)

VEHICLE CHECK a. |_|_|

VEHICLE CLEANING b. |_|_|

OTHER PREPARATION & FINISHING-UP TIME c. |_|_|

RIDING IN VEHICLE (from office to route and route to office) d. |_|_|

Total time BEFORE & AFTER ROUTE (add a. + b. + c. + d.) B. |_|_|

Does this total seem correct to you? (If not, redo the times.)

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EXHIBIT 12

DISPOSAL TIME
Average time spent for ONE ROUND trip to disposal site.

	(in minutes)
RIDING IN VEHICLE (to disposal site from route and to route from disposal site)	a. ☐☐
RIDING IN VEHICLE (at disposal site, including time waiting in vehicle)	b. ☐☐
DIRECTING AND GUIDING VEHICLE	c. ☐☐
EMPTYING PACKER	d. ☐☐
CLEANING OUT PACKER	e. ☐☐
Disposal time per trip (add a. + b. + c. + d. + e.)	f. ☐☐
No. of trips to disposal site (average per day)	g. ☐.☐
Total DISPOSAL TIME (multiply f. x g.)	C. ☐☐☐

Does this total seem correct to you? (If not, redo the times)

COLLECTING TIME

Compute the COLLECTING TIME A - (B + C)	D. ☐☐☐ min.
Does this COLLECTING TIME seem correct to you? (If not, recheck your figures)	
Average Number of Stops per route.	E. ☐☐☐☐ stops
Average Number of Minutes per Stop (D ÷ E) Round to the nearest whole minute.	F. ☐ min.

Divide up the Average Number of Minutes per Stop (F) into the following activities:

	(in SECONDS)
WALKING (to and from containers)	☐☐☐
LIFTING (containers, bags, shrubbery, etc.)	☐☐
CARRYING	☐☐
DUMPING (into hopper)	☐☐
WALKING or RIDING ON STEP (to next stop)	☐☐☐

How often do you RIDE ON STEP to the next stop?	About 1 out of every ☐☐ stops (e.g., about 1 out of every 05 stops)
How often do you OPERATE the PACKING MECHANISM?	About 1 out of every ☐☐ stops
Average number of containers picked up per stop.	☐☐

☐☐☐☐☐☐☐ A 0 3

form for one job class: residential refuse collector, non-driver. It is necessary to use a generally similar sheet for each job class, that includes the specific activities performed by that job class.

3.5 Updating

It is necessary to keep the various types of basing data updated and to keep track of "open" cases where costs and lost time are not finally known. Four sets of items are involved:

3.5.1 Employee Information Updating. During the Field Test, updating of employee data was initially performed by contractor staff through telephone calls, letters and similar unstructured means. A system was developed in which a computer printout is sent to each participant, listing each employee name, Social Security number (or other identifying number), date of hire, date of birth, job class, and date promoted into that job class. An example is shown in EXHIBIT 13. The primary use of this printout is for the participant to enter terminations and job class changes as they occur. A printout is sent to each participant once per month and he returns the previous printout, amended to show changes and terminations, at that time. The printout is also useful to management in that it provides a convenient listing of current employees. Many solid waste agencies do not have such a listing. The listing is also used by the participant when he

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       DATE - MARCH 1975
       PARTICIPANT - 1000001
       TYPE OF PRINTOUT - EMPLOYEE DATA UPDATE LIST

       NAME             SOC SEC       HIRE      BIRTH     JOB  DATE          STATUS CHANGE OR TERMINATION
    LAST      FI MI     NUMBER        DATE      DATE     CLASS PROM     WRITE JOB CLASS & CODE    TERMINATION  DATE

 JOHNSON       B M   002-36-5931    10-12-59    07-32    41312 10-12-72
```

EXHIBIT 13

Sample Employee Data Update List

completes Injury Report Forms, to provide the Social Security number (or other identifying number), and to ensure that the injured employee is on the list.

For new hires, the same Employee Information Form is completed that is used at the start-up of the study (see Section 3.3).

3.5.2 Equipment/Vehicle Information Updating. During the Field Test, a system was developed for updating information on equipment and vehicles, that is similar to that developed for employee information. EXHIBIT 14 shows an example of an equipment/vehicle update form. This is sent quarterly to all participants, and is amended to indicate any equipment that has been withdrawn from use and returned in a similar manner to the employee printout. For each item of new equipment added, an Equipment/Vehicle Information form is completed, as described in Section 3.4.1.

3.5.3 Time Lost and Direct Cost Status. EXHIBIT 15 shows an example of a listing sent to each participant on a monthly basis in order to give the status (open or closed) of injuries, together with the cost and time lost to date, and other identifying information. The listing includes all open cases, and all cases closed within the last month. The participant's staff member responsible for keeping track of injury costs and lost time uses this listing as a means of reviewing newly closed cases to ensure that the costs and time

```
                         INJURY REPORTING AND INFORMATION SYSTEM                                  PAGE 1
PARTICIPANT - 1000001

DATE - FIRST QUARTER 1975
TYPE OF PRINTOUT - EQUIPMENT/VEHICLE DATA UPDATE LIST

EQUIPMENT NO.     MAKE     MODEL        TYPE        CAPACITY      YEAR    DATE PURCHASED       OUT OF USE DATE
   000001         LEACH     2-R    REAR-END LOADER    25Y          69         10-70
```

EXHIBIT 14

<u>Sample Equipment/Vehicle Data Update List</u>

```
                              INJURY REPORTING AND INFORMATION SYSTEM                                   PAGE 1

             PARTICIPANT - 1000001
             DATE - MARCH 1975
             TYPE OF PRINTOUT - TIME LOST AND DIRECT COSTS STATUS

OPEN/        INJURY   DAY OF        NAME        SOC SEC     TYPE      WKDY      MEDICAL   LOST TIME        P D/DEATH
CLOSE        NUMBER   INJURY    LAST    FI MI   NUMBER      CASE      LOST      EXPENSE     COSTS           BENEFITS

  C          00001    6-18-75  JOHNSON  B M  002-36-5931  LT        150         200       3,600            14,000
             FALL TO DIFF LEVEL WHILE DISMOUNTING INJURING BACK RESULTING IN SPRAIN/STRAIN

  0          00032    1-21-75  STEWART  J C  065-14-3601  NWLW                  105
             STRUCK BY OBJECT WHILE LIFTING INJURING LEG RESULTING IN CUT/LACER/PUNCTURE
```

EXHIBIT 15

Sample Time Lost and Direct Costs Status lost figures listed are final, and to identify open cases so that they can be followed up. The listing also acts as an injury log, so that injuries can readily be reviewed.

3.5.4 Annual Updates. During the Field Test, it was found that changes in management practices, crew size, equipment utilization and similar factors do not change rapidly in the typical solid waste agency, so that an update of these items needs to be made only annually, or at a time of some major change.

3.6 Information on Management Practices

The practices used by management in hiring, training, safety programs, and in requirements related to safety, e.g., container regulations and equipment specifications, are factors that might be expected to be significantly related to injury rate. While it is not possible to perform intercomparisons between participants on the basis of these factors in a Field Test involving only 15 participants, it appeared desirable to formulate a set of questions bearing on these points that could be used in a larger scale system. During the Field Test several sets of questions on management practices were asked during visits, and a set that appeared to be feasible for gathering information through a questionnaire rather than a visit was selected. This set is included in EXHIBIT 16, the Background Information form. This form serves to identify persons to contact, gives the types of services to be included

BACKGROUND INFORMATION

IDENTIFICATION

1. Name of organization ____________________

Address: Room No. ____________________

Street ____________________

City, State, ZIP ____________________

Phone Number (include Area Code) ____________________

2. Persons for Contact:

NSWISS Coordinator

Name ____________________

Title ____________________

Address: Room No. ____________________

Street ____________________

City, State, ZIP ____________________

Phone Number ____________________

Person to contact for Time Lost & Cost Data

Name ____________________

Title ____________________

Address: Room No. ____________________

Street ____________________

City, State, ZIP ____________________

Phone Number ____________________

Person to contact for Employee Information

Name ____________________

Title ____________________

Address: Room No. ____________________

Street ____________________

City, State, ZIP ____________________

Phone Number ____________________

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☐☐☐☐☐☐☐

EXHIBIT 16

SECTIONS COVERED BY IRIS

Indicate which sections of your organization you plan to include in IRIS and the number of employees in these sections.

	(Circle one)	Approximate No. of Employees
Residential Collection	Yes	____
Your Organization **Name** for this (indicate whether it is a department, division, section, unit, etc.) ____	No	
Commercial Collection	Yes	____
Name ____	No	
Dead Animal Collection	Yes	____
Name ____	No	
Disposal	Yes	____
Name ____	No	
Indicate the number of disposal operations your organization is including in IRIS.		
No. of:		
____ Landfill(s)		____
____ Incinerator(s)		____
____ Transfer Station(s)		____
____ Recycling Operation(s)		____
Street Cleaning	Yes	____
Name ____	No	
Weed & Litter Control	Yes	____
Name ____	No	
Equipment Maintenance	Yes	____
Name ____	No	
Administration (including clerical personnel)	Yes	____
Name ____	No	
Other	Yes	____
Name(s) ____ ____ ____	No	
TOTAL NUMBER OF EMPLOYEES INCLUDED IN IRIS		____
Are ALL employees of your organization going to be included in IRIS.	Yes No	

☐☐☐☐☐☐☐☐

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OPERATIONS INFORMATION

(Check those that apply)

1. Is your organization a

____ private solid waste company
____ municip. solid waste

2. Does your organization have

____ back-yard collection only
____ curb-side collection only
____ both back-yard & curb-side

3. Do your organization's collection crews work on a

____ task system basis only
____ 8-hour basis only
____ some task and some 8-hour

How does your task system work (e.g., when route is finished, when all employees finish, certain tonnage, etc.)

4. Check the collection crew size(s) at your organization

____ 1-man crew
____ 2-man crew
____ 3-man crew
____ 4-man crew
____ 5-man crew

5. Check the types of collection equipment used at your organization

____ Front-end Loader(s)
____ Rear-end Loader(s)
____ Side Loader(s)
____ Roll-Off(s)
____ Load-Lugger(s)
____ Container Delivery Truck(s)
____ Trailers

List other types of equipment, if used

____
____
____
____

6. Indicate frequency of residential collection

____ once-a-week
____ twice-a-week

☐☐☐☐☐☐☐

CURRENT INJURY REPORTING SYSTEM

Describe briefly what happens when an injury occurs:

1. How does an injured employee on a route notify the office of the accident?

2. Are all injured employees required to visit a doctor or medical facility?

____ Yes

____ No

3. Does your organization have a set of doctors that the injured employee must use?

____ Yes

____ No

4. Do you have a first aid station?

____ Yes

____ No

5. Who (what position(s)) now completes the injury reports at your organization?

____

6. How strong is the effort to have all injuries reported?

Are injury reports normally completed on first-aid only injuries?

____ Yes

____ No

7. What investigations are made of injuries? By whom? For what types of injuries?

☐☐☐☐☐☐☐

8. Who (what position(s)) REGULARLY reviews completed injury reports?

____

____

____

9. What types of injury statistics are currently being compiled by your organization? By whom? Who reviews them?

SAFETY PROGRAM

1. How many personnel does your organization have assigned to solid waste safety?

_____ full-time _____ as a part of their job
no. no.

2. a. Do you have a safety committee?

____ Yes
____ No

b. At what level is it organized? (e.g., departmental, by district, etc.)

c. Who are its members? How are they chosen? Is it mandatory to attend?

d. Now often does the committee meet?

e. What is the committee's purpose and activities?

f. Does the committee have punitive power? (e.g., can it recommend suspension of employees?)

3. a. Who is in charge of your safety program?

b. What does it include?

c. Does your safety program include

____ movies

____ pamphlets

____ posters

____ demonstrations

____ tail gate meetings

4. Estimate how much money per year your organization spends on safety programs. (NOT including the cost of injuries.)

5. a. Do you have any complaints about your collection equipment from the standpoint of safety? What are they?

____ Yes

____ No

b. Do you have difficulties getting the safety specifications you want included in your equipment bids?

____ Yes

____ No

What procedure do you follow to get a safety specification added?

c. What kinds of safety devices do you currently have on your packer trucks?

6. Do your employees belong to a union? What role does the union play in safety?

____ Yes

____ No

7. a. What types of container rules does your organization come under?

For Container type? (e.g., no oil drums)

For Container size?

For Container weight?

For Container condition?

For Container location?

b. If you are a private firm, are these municipal regulations or simply rules which your organization uses?

c. How well are these rules enforced?

8. What are the injury rates at your organization? (if you know them)

OSHA Incidence Rate __________

ANSI Frequency Rate __________

ANSI Severity Rate __________

9. Do you think the number of injuries at your organization is greater than or less than the number of injuries at other organizations in the solid waste management industry?

____ greater

____ less

Why?

10. What do you think might be the major causes of injuries at your organization?

11. Do you think that with sufficient time and money, anything could be done to reduce accidents at your organization?

____ Yes

____ No

What could be done?

12. Do you have any plans for improving safety at your organization in the near future? Please describe.

____ Yes

____ No

HIRING & TRAINING

1. a. Do you have any hiring qualifications that are related to safety?

____ Yes

____ No

What are these?

b. Do you try to hire only experienced personnel?

____ Yes

____ No

c. Do you give pre-employment physicals before hiring? ____ Yes ____ No

What do they include?

2. a. What type of training do you provide a new-hire? Does it include more than teaching him the routes? ____ Yes ____ No

b. What aspects of safety are included in the training?

c. Are there any instructions on how to lift? ____ Yes ____ No

How is this instruction given?

d. How much time is spent on training a new employee?

e. Is there any follow-up training for experienced employees? ____ Yes ____ No

What type of training? For how long?

3. Estimate how many dollars per year your organization spends on training. $__________

MATERIALS TO ATTACH

If you have any of the following materials readily available to attach to this form, it would greatly improve IRIS' understanding of your organization.

1. A copy of the Injury Report Form which your organization uses.
2. An organization chart showing the employees to be included in IRIS.
3. A job class list, with accompanying job descriptions (if you have them), showing job classes to be included in IRIS.
4. A copy of any recent injury statistics you have compiled.
5. Any materials on your safety or training programs.
6. City container regulations.

in the system, provides data on operating methods, and describes the current injury reporting and investigation system.

Other management practices covered include safety programs, safety-related equipment specifications, container regulations, and hiring and training. Dollar expenditures on safety and training activities are requested. Management's opinion on the relative seriousness and the causes of injuries at that organization is requested.

This information can also be used to suggest how the output of analyzed data can best be used by a participant.

3.7 Analysis and Reporting

Data reported by participants during the Field Test was reviewed by contractor personnel; coded using standard codes, where necessary; keypunched onto cards, read onto tape, and edited by an editing program.

Analyses were performed using programs written in ANS-COBOL. Printouts were in one of two general formats, a single factor analysis and a "profile." Tables and histograms presenting selected data are included and discussed in the Tabulation of Data volume submitted with this Final Report.

An example of the format for a single factor report, as developed and used in the Field Test is shown in EXHIBIT 17. Here the factor being analyzed is location, with categories collection route, incinerator, etc. For each category, the following 40 values were computed and printed:

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```
***   INJURY REPORTING AND ANALYSIS SYSTEM   ***                                  DATE 05-01-75      PAGE -- 1

      INDUSTRY = SOLID WASTE MANAGEMENT
      PARTICIPANT = ALL
      REPORTING PERIOD = 10-1973 THRU 07-1974
      COST AND LOST DAYS COMPUTED FROM DATA AVAILABLE AS OF  05-01-75
      TYPE OF ANALYSIS = INJURY RATES FOR                         LOCATION

   FACTOR BEING        MAN HOURS         O S H A  INCIDENCE  RATES                         SEVERITY RATE   ANSI       ANSI          DIRECT COS
     ANALYZED             OF            TOTAL      LOST    NONFATAL W/O   DEATHS   COMPUTED USING  FREQUENCY  SEVERITY         PER
                       EXPOSURE       RECORDABLE  WORKDAY  LOST WORKDAYS           OSHA DEFINITNS   RATE       RATE            MAN-HO.
                      ***********      ******     ******     ******       ******     ********     ********   ********        *********
      (1)                (2)             (3)        (4)        (5)          (6)        (7)           (8)        (9)              (10)

  COLLECTION ROUTE    2,522,204         55.26      38.77      16.49                  433.02        193.67   6,875.32           29.53
  INCINERATOR            89,727         17.83       8.91       8.91                   31.20         44.57     289.76            1.70
  TRANSFER STATION       92,797         10.77       4.31       6.46                   81.89         21.55     561.91            6.26
  OFFICE & YARD         736,824         10.58       6.51       4.07                   72.20         32.57     540.15            2.95
  LANDFILL & DUMP       337,434         38.52      25.48      13.03          .59     267.31        127.43   9,942.41           52.36
  OTHER               1,124,340
  UNKNOWN

****  TOTAL  ****     4,903,326         39.23      26.67      12.56          .04     295.75        133.37   5,350.64           19.03
```

EXHIBIT 17

Example of Single-Factor Analysis: Accidents by Location

```
          ***  INJURY REPORTING AND ANALYSIS SYSTEM ***                 DATE 05-01-75       PAGE  2
     INDUSTRY = SOLID_WASTE_MANAGEMENT
     PARTICIPANT = ALL
     REPORTING PERIOD = 10-1973 THRU 07-1974
     COST AND LOST DAYS COMPUTED FROM DATA AVAILABLE AS OF  05-01-75
     TYPE OF ANALYSIS = SUMMARY OF NO. OF INJURIES FOR      LOCATION

  FACTOR BEING            NUMBER OF INJURIES                              NONFATAL CASES    LOST         PERMANENT
    ANALYZED                            O S H A        A N S I      FIRST    WITHOUT LOST     TIME        DISABILITY      DEATHS
                         TOTAL         RECORDABLE     DISABLING      AID       WORKDAYS       CASES         CASES
                       NO.     $      NO.     $      NO.     $     NO.    $    NO.    $     NO.    $     NO.    $     NO.    $
                      ***** ******  ***** ******  ***** ******  ***** ****** ***** ******  ***** ****** ***** ****** ***** ******
      (1)             (11)   (12)   (13)   (14)   (15)   (16)   (17)   (18)  (19)   (20)   (21)   (22)  (23)   (24)  (25)   (26)

 COLLECTION ROUTE      973  72.45    697  72.45    489  74.77    276  28.37   208  21.38    470  48.30    19  1.95
 INCINERATOR            11    .82      8    .83      4    .61      3  27.27     4  36.36      4  36.36
 TRANSFER STATION        6    .45      5    .52      2    .31      1  16.67     3  50.00      2  33.33
 OFFICE & YARD          60   4.47     39   4.06     24   3.67     21  35.00    15  25.00     24  40.00
 LANDFILL & DUMP        90   6.70     65   6.76     43   6.57     25  27.78    22  24.44     40  44.44     2  2.22     1  1.11
 OTHER
 UNKNOWN               203  15.12    148  15.38     92  14.07     55  27.09    56  27.59     90  44.33     2   .99

 ****  TOTAL   **** 1,343 100.00    962 100.00    654 100.00    381  28.37   308  22.93    630  46.91    23  1.71     1   .07
```

```
          ***   INJURY  REPORTING  AND  ANALYSIS  SYSTEM   ***                              DATE  05-01-76        PAGE   3
        INDUSTRY - SOLID WASTE MANAGEMENT
        PARTICIPANT - ALL
        REPORTING PERIOD - 10-1973 THRU 07-1974
        COST AND LOST DAYS COMPUTED FROM DATA AVAILABLE AS OF  05-01-75
        TYPE OF ANALYSIS - TIME LOST AND DIRECT COSTS FOR       LOCATION

     FACTOR BEING      WORKDAYS         WORKDAYS AT         CALENDAR            TIME               DIRECT
       ANALYZED          LOST           ANOTHER JOB         DAYS LOST          CHARGES              COSTS
                      NO.     %         NO.     %          NO.      %        NO.     %          $        %
                     ***** ******      ***** ******       *****   ******    ***** ******    ****** ******
         (1)         (27)   (28)       (29)   (30)        (31)     (32)     (33)   (34)      (35)    (36)

   COLLECTION ROUTE  5,445  75.26        16 100.00       8,158    74.36   10,083  62.31    391,608  66.31
   INCINERATOR          14    .19                           26      .24                        964    .16
   TRANSFER STATION     38    .53                           54      .49                      3,090    .52
   OFFICE & YARD       266   3.68                          398     3.63                     13,775   2.33
   LANDFILL & DUMP     451   6.23                          736     6.71    6,000  37.08    111,793  18.93
   OTHER
   UNKNOWN           1,021  14.11                        1,599    14.57      100    .62     69,365  11.74

  ****   TOTAL  **** 7,235 100.05        16 100.00      10,971   100.00   16,183 100.00    590,595 100.00
```

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```
***  INJURY REPORTING AND ANALYSIS SYSTEM  ***                    DATE 05-01-75          PAGE  9

     INDUSTRY - SOLID WASTE MANAGEMENT
     PARTICIPANT - ALL
     REPORTING PERIOD - 10-1973 THRU 07-1974
     COST AND LOST DAYS COMPUTED FROM DATA AVAILABLE AS OF  05-01-75
     TYPE OF ANALYSIS - AVERAGES FOR                          LOCATION

   FACTOR BEING          NO. OF           AVERAGE NO. OF          ANSI          AVERAGE DIRECT
     ANALYZED      WORKDAYS LOST PER     WORKDAYS AT            AVERAGE          COSTS PER
                   LOST WORKDAY CASE     ANOTHER JOB         SEVERITY RATE        INJURY
                       ********           ********             ********         **********
       (1)              (37)               (38)                 (39)               (40)

   COLLECTION ROUTE     11.13               8.00                35.46             402.97
   INCINERATOR           3.50
   TRANSFER STATION     19.00                                    6.50              87.63
   OFFICE & YARD        11.08                                   27.00             615.00
   LANDFILL & DUMP      10.73                                   16.58             229.58
   OTHER                                                       156.66           1,242.14
   UNKNOWN              11.09
                                                                18.77             341.69

****   TOTAL  ****      11.07               8.00                40.11             439.75
```

- man-hours of exposure (computed as described in Section 3.3)
- OSHA incidence rates (total recordable, lost workday, non-fatal without lost workdays, and death)
- a severity rate computed using OSHA definitions. This is not an OSHA standard value, but proved to be useful to those using the data. It is computed as the number of workdays lost per 200,000 man-hours.
- an ANSI frequency rate
- an ANSI severity rate
- direct costs per man-month. This is used for comparison purposes and represents the total direct costs associated with that class of injury per average man-month at risk.
- the number of injuries, broken down in two ways. The first breakdown is by total, OSHA recordable and ANSI disabling. The percentage that each represents of the total for all categories, i.e., all locations in this case, is also given. For example, OSHA recordable injuries on the collection route represented 72.45% of all OSHA recordable injuries at all locations. The second breakdown is by first aid, non-fatal cases without lost workdays, lost time cases, permanent disability cases, and deaths. The percentage given here is for one category. For example, 48.30% of the injuries on the collection route were lost time cases.
- the number of workdays lost and percentage of the total workdays lost for all categories
- the number of workdays at another job (an OSHA standard, e.g., light duty) and the corresponding percentage
- the number of calendar days lost, and the corresponding percentage
- time charges, as used in the ANSI system, e.g., 6,000 days for a death, and the corresponding percentage

- direct costs and the corresponding percentage
- the average number of workdays lost per lost workday case
- the average number of workdays at another job
- the ANSI Average Severity Rate
- the average direct costs per injury

During the Field Test, printouts of this type were sent to participants and comments were requested. The most frequent comment was that there was too much information on each category, arising from the use of both ANSI and OSHA standards. Accordingly, the results of the Field Test suggest that only one standard should be used, as discussed in Section 3.2.1.

The format for a profile report is shown in EXHIBIT 18. The concept of a profile report is still in a developmental stage, and its objective is to identify those combinations of factors that are responsible for repeated injuries and to present the information in a readily comprehended form that shows the relationship of the factors. Using a single factor presentation is not as directly useful in many cases. For example, knowing the injury rate for back strains does not give information on how they happen.

In the profile, the various factors are strung together by the computer into an english sentence. The number of injuries, workdays lost, and cost data associated with that profile are also listed. During the Field Test, the profile printouts used the same headings as the single-factor printouts, with the exception

```
        ***  INJURY REPORTING AND ANALYSIS SYSTEM  ***                                              DATE 05-01-78      PAGE   3
  INDUSTRY - SOLID WASTE MANAGEMENT
  PARTICIPANT - ALL
  REPORTING PERIOD - 07-1973 THRU 09-1974
  COST AND LOST DAYS COMPUTED FROM DATA AVAILABLE AS OF  05-01-76
  TYPE OF ANALYSIS - SUMMARY OF NO. OF INJURIES FOR       ACCIDENT PROFILE

   PROFILE             NUMBER OF INJURIES                              NONFATAL CASES       LOST        PERMANENT
                          O S H A         A N S I         FIRST       WITHOUT LOST        TIME       DISABILITY
                TOTAL    RECORDABLE      DISABLING         AID          WORKDAYS          CASES        CASES         DEATHS
               NO.   %    NO.   %        NO.   %         NO.   %       NO.   %         NO.   %     NO.   %       NO.   %
               ***** ****** ***** ******  ***** ******   ***** ******  ***** ******   ***** ****** ***** ******  ***** ******
    (1)        (11)  (12)  (13)  (14)    (15)  (16)     (17)  (18)    (19)  (20)     (21)  (22)   (23)  (24)    (25)  (26)

 OVEREXERTION WHILE  LIFTING INJURING  ARM RESULTING IN  SPRAIN/STRAIN
                5    .30     3   .26       2   .17        2  40.00      1  20.00       2  40.00
 OVEREXERTION WHILE  LIFTING INJURING  WRIST RESULTING IN  SPRAIN/STRAIN
                5    .30     3   .26       2   .17        2  40.00      1  20.00       2  40.00
 OVEREXERTION WHILE  LIFTING INJURING  BACK RESULTING IN  SPRAIN/STRAIN
               88   6.33    73  6.22      60  5.12       15  17.05     13  14.77      58  65.91     2   2.27
 OVEREXERTION WHILE  LIFTING INJURING  ABDOMEN RESULTING IN  SPRAIN/STRAIN
                8    .48     7   .60       5   .43        1  12.50      2  25.00       5  62.50
 OVEREXERTION WHILE  LIFTING INJURING  GENITALIA,GROIN RESULTING  SPRAIN/STRAIN
                8    .48     7   .60       4   .34        1  12.50      3  37.50       4  50.00
 OVEREXERTION WHILE  LIFTING INJURING  MULTIPLE PARTS RESULTING IN  SPRAIN/STRAIN
                5    .30     3   .26       3   .26        2  40.00                     3  60.00
 OVEREXERTION WHILE  USING HAND TOOL INJURING  BACK RESULTING IN  SPRAIN/STRAIN
                5    .30     3   .26       3   .26        2  40.00                     3  60.00
 INSECT BITE/STING WHILE  STANDING/WALKING INJURING  ARM RESULTING IN  INSECT BITE/STING
                6    .36     3   .26       1   .09        3  50.00      2  33.33       1  16.67
 ANIMAL BITE/SCRATCH WHILE  CARRYING INJURING  LEG RESULTING IN  ANIMAL BITE
                5    .30     2   .17                      3  60.00      2  40.00
 ANIMAL BITE/SCRATCH WHILE  STANDING/WALKING INJURING  LEG RESULTING IN  ANIMAL BITE
                6    .36
                                                          6 100.00
 STEPPED ON SHARP OBJ WHILE  CARRYING INJURING  FOOT RESULTING IN  CUT/LACER/PUNCTURE
                7    .42     5   .43       1   .09        2  28.57      4  57.14       1  14.29
 STEPPED ON SHARP OBJ WHILE  LIFTING INJURING  FOOT RESULTING IN  CUT/LACER/PUNCTURE
                6    .36     4   .34       2   .17        2  33.33      2  33.33       2  33.33
 STEPPED ON SHARP OBJ WHILE  STANDING/WALKING INJURING  FOOT RESULTING IN  CUT/LACER/PUNCTURE
                9    .64     5   .43       3   .26        4  44.44      2  22.22       3  33.33
```

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EXHIBIT 18

Example of Profile Analysis: Four-Factor Accident Profile

```
      ***  INJURY  REPORTING  AND  ANALYSIS  SYSTEM  ***                                DATE 05-01-75      PAGE   7
        INDUSTRY - SOLID WASTE MANAGEMENT
        PARTICIPANT - ALL
        REPORTING PERIOD - 07-1973 THRU 09-1974
        COST AND LOST DAYS COMPUTED FROM DATA AVAILABLE AS OF  05-01-75
        TYPE OF ANALYSIS - TIME LOST AND DIRECT COSTS FOR       ACCIDENT PROFILE

     PROFILE           WORKDAYS        WORKDAYS AT       CALENDAR         TIME           DIRECT
                         LOST          ANOTHER JOB       DAYS LOST        CHARGES          COSTS
                       NO.    %        NO.    %          NO.    %         NO.    %       $       %
                     ***** ******    ***** ******      ***** ******     ***** ******   ****** ******
       (1)           (27)   (28)     (29)   (30)       (31)   (32)      (33)   (34)    (35)   (36)

 OVEREXERTION WHILE  LIFTING INJURING  ARM RESULTING IN  SPRAIN/STRAIN
                       19    .16                        19    .15                       963    .12
 OVEREXERTION WHILE  LIFTING INJURING  WRIST RESULTING IN  SPRAIN/STRAIN
                        5    .06                         9    .07                       421    .05
 OVEREXERTION WHILE  LIFTING INJURING  BACK RESULTING IN  SPRAIN/STRAIN
                      831   9.66                     1,252   9.58                    51,132   6.55
 OVEREXERTION WHILE  LIFTING INJURING  ABDOMEN RESULTING IN  SPRAIN/STRAIN
                       43    .50                        61    .47                     3,436    .44
 OVEREXERTION WHILE  LIFTING INJURING  GENITALIA,GROIN RESULTING  SPRAIN/STRAIN
                       19    .16                        23    .18                     1,093    .14
 OVEREXERTION WHILE  LIFTING INJURING  MULTIPLE PARTS RESULTING IN  SPRAIN/STRAIN
                       15    .17                        21    .16                       671    .09
 OVEREXERTION WHILE  USING HAND TOOL INJURING  BACK RESULTING IN  SPRAIN/STRAIN
                       19    .22                        29    .22                       677    .09
 INSECT BITE/STING WHILE  STANDING/WALKING INJURING  ARM RESULTING IN  INSECT BITE/STING
                        1    .01                         1    .01                       174    .02
 ANIMAL BITE/SCRATCH WHILE  CARRYING INJURING  LEG RESULTING IN  ANIMAL BITE
                                                                                         79    .01
 ANIMAL BITE/SCRATCH WHILE  STANDING/WALKING INJURING  LEG RESULTING IN  ANIMAL BITE
                                                                                         45    .01
 STEPPED ON SHARP OBJ WHILE  CARRYING INJURING  FOOT RESULTING IN  CUT/LACER/PUNCTURE
                        1    .01                         1    .01                       242    .03
 STEPPED ON SHARP OBJ WHILE  LIFTING INJURING  FOOT RESULTING IN  CUT/LACER/PUNCTURE
                        4    .05                         8    .06                       268    .03
 STEPPED ON SHARP OBJ WHILE  STANDING/WALKING INJURING  FOOT RESULTING IN  CUT/LACER/PUNCTURE
                        6    .07                         7    .05                       402    .05
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of the rates, which cannot be computed for profiles because no exposure data is available. EXHIBIT 18 shows a four factor profile, for the factors accident type (e.g., overexertion), activity (e.g., lifting), part of body (e.g., shoulder), and injury description (e.g., strain/sprain).

With further development, any combination of factors can be printed out as a profile, so that injuries associated with particular kinds of container, e.g., plastic bags, type of waste, etc., can be examined.

It is recommended that fewer headings be used, namely the number and percent of total for OSHA recordable injuries, and the number, percent of total, and average for both workdays lost and direct costs. This will simplify the examination of the printouts.

The following printouts were prepared during the Field Test in order to test feasibility, in single factor format unless otherwise indicated:

- Part of Body
- Nature of Injury
- Activity (single factor and profile)
- Accident Type (single factor and profile)
- Characteristics of Waste (profile)
- Equipment Type
- Day of Week

- Hour of Day
- Accident Site
- Crew Size
- Number of Hours on Job Prior to Injury
- Job Classification
- Division
- Race
- Age
- Height
- Weight
- Education
- Type of Employment (e.g., temporary)

3.8 Telephonic System

One major departure from the remainder of the Field Test involved the development and testing of a telephonic injury information system. In this system, data on injuries is telephoned by the participant (the reporter) to a central office where trained coding staff (coders) enter data into the computer. Data on employees and other basing data is, for the most part, collected on forms by mail.

Collection of injury information from the participants over the telephone by a trained central office coder offers the following specific potential advantages compared to the use of an Injury Report Form:

(1) While the IRF must include all possible alternatives and thus be rather cumbersome, the telephone conversation need only proceed along those lines applicable to the specific accident. For example, if the accident did not involve a fall, none of the questions regarding the location of the fall need be asked on the telephone, while they must be included in an IRF. The reporter need not be provided with a list of all the multiple choices available as a response to a given question. The reporter can be allowed to state his choice in his own language, and the recording person can then focus in on the appropriate multiple choice selection, by asking supplementary questions if necessary.

(2) The coder can interpret the response of the reporter to a specific question, and ensure that the question was understood.

A substantial amount of training is required to prevent inappropriate answers on an IRF, such as the response "he hurt his leg" to the question "what was the employee doing at the time he was injured." On the telephone, the question can be repeated and rephrased to ensure that the answer is responsive. This avoids the need for careful and longwinded phrasing of questions on the IRF, arising from the desire to be unambiguous. The telephonic system also cuts down on the amount of training that it is necessary to provide for participant staff responsible for reporting injuries.

(e) The coder can input the data directly to a time-sharing computer, via a CRT terminal, while the reporter is on the line. This allows the CRT screen to be used to list questions and multiple choice selections for use by the coder. Data can be edited as entered and inconsistencies can be displayed, e.g., the name and Social Security number given for an injured employee can be checked against an employee file. The computer can then display on the CRT a summary of the injury data for review by the coder, and can generate a hard copy of the injury summary that can be mailed to the participant.

A small scale trial of the telephonic method was made using participant 11. A toll-free telephone number was made available, and the modifications were explained, at a special training session, to the participant staff responsible for reporting injuries. These reporters were furnished with copies of the IRF to use as reminders of what questions would be asked, and the coder took down the data on an IRF since the computer program for on-line data entry had not yet been developed. No difficulty was experienced in taking down data during the three months that the system operated. Each telephone call lasted 2-3 minutes. Periodic reports were made to a supervisor at the participant, who checked that no injuries went unreported. Upon receipt of telephone notification of an injury, a Time Lost and Cost Data form was made up containing a brief identification of the injury (employee's name, Social Security number, date of injury, etc.). This sheet was mailed to the participant to collect time lost and cost data.

This system was very well accepted by this participant. Each of the reporters (the foremen) expressed the view that telephone reporting was simpler, faster, and more fun. It is therefore highly recommended that the telephonic method be considered for a future larger scale study.

IV. CONCLUSIONS: FEASIBILITY OF INJURY INFORMATION SYSTEM

> The conclusion reached as a result of the Field Test is that an injury reporting and analysis system for the solid waste management industry is feasible.

During the Field Test, each element of an injury information and analysis system was formulated, tested, and revised where necessary (often many times) until a workable method was developed. These elements provided for the definition and collection of data on injuries, employee characteristics, work practices, equipment, and other factors relevant to injury rate. The elements were assembled into a working system that was tested and found capable of yielding analyzed data. Specifically, using 15 participating solid waste agencies of widely different characteristics and geographical locations, it was found that:

- the Injury Report Form developed (which is partially custom designed for each individual participant) can be completed on time and accurately by participant staff at the foreman or clerk level, without on-site training by contractor personnel.
- the system for collecting time lost and direct cost data, which involves interaction between a central office (during the Field Test, the contractor) and each participant, worked well even though some injuries continue to accumulate costs for many months.
- participants were able to provide the required data on employees and equipment. A form by which start-up data on employees can be collected proved workable and can be completed by each employee working for a participant which does not maintain detailed and easily accessible personnel records.

- participants will provide update data on employees and equipment in a timely and comprehensive manner.
- participants are able to comprehend and use the printouts of analyzed data.

The operation of the system to provide analyzed data was primarily directed towards establishing feasibility. Because of the scale of the Field Test, it was not possible to generate a large amount of analyzed data that is immediately applicable. However, some significant findings were made and are described and discussed in a companion volume to this Final Report, entitled Tabulation of Data. Sufficient analyzed data was produced to demonstrate that the system will provide information that can:

(a) motivate management to take action on safety, by enabling realistic comparisons to be made between different participants. Each participant can compare injury rates, for specific aspects of his operations, with other participants. Since the "best" participants have an injury rate (for certain areas) that can be five or more times lower than the "worst," the attitude that injuries are inherent to this industry becomes difficult for management to maintain.

(b) point out areas that need priority action, and justify, on a cost basis, the implementation of accident reduction measures.

(c) give information necessary to select from the safety viewpoint collection methods and other work practices, e.g., the use of intermediate containers.

(d) be used to evaluate the effectiveness of accident countermeasures.

In the initial stages of the Field Test, the system relied heavily upon contractor staff to collect data from participants. In accordance with the goal to develop a system in which participants would feed information into a central office, as discussed in

Section 1.3, the later stages of the Field Test were directed towards the development of the required forms and procedures. The forms and procedures for an Injury Reporting and Information System for Solid Waste Management (IRIS) are described in a companion volume to this Final Report, entitled User's Manual.

Acceptance by the 15 participants in the Field Test of forms and procedures similar to those in the User's Manual has been excellent. The participants have remained in the Field Test through a very trying period in which continuous changes were being made in the forms and procedures, and in which there was a large delay before it was possible to return analyzed data to the participants.

A variation in which injury information was telephoned to the central office, rather than sent on an Injury Report Form, was developed and tested with one participant. This variation proved to be highly successful and of benefit both to the participant and the central office staff. This variation should be followed up if possible and seriously considered for use in IRIS

During the Field Test it was found that there is ample evidence of high demand for the type of information that could be provided by IRIS. The following types of organizations requested information from the contractor:

- the participating solid waste agencies (requested specific analyses and also general information to be provided to higher management).

- other non-participating solid waste agencies (requested information on a large variety of topics, including crew size, task system, backyard vs curbside collection, use of plastic bags, etc.).

- a regional state-sponsored solid waste management agency (requested consultation on how to organize a regional solid waste injury information system in their area).

- a User Requirements Committee set up under a National Science Foundation contract directed towards the development of equipment standards for refuse collection.

- the ANSI Z245 Committee, working on safety standards for refuse collection.

- a National Safety Council group working on safety manuals related to work practices in the solid waste management industry.

- workmen's compensation insurance companies interested in methods of analyzing and presenting data in a form that would help their clients control injuries.

- a manufacturer developing new equipment.

- many individuals and groups concerned with safety in general.

The conclusion reached as a result of the Field Test is that an injury reporting and analysis system, of the type described in a companion volume as an Injury Reporting and Information System for Solid Waste Management, is feasible and that there is a need for the information that would be generated.

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The following is a selected list of references reviewed during this study. The list is not meant to be comprehensive, but it may well be a start towards a comprehensive bibliography of occupational health and safety in the solid waste management industry which at present does not exist.

The references here cover only *occupational* safety and health in the solid waste management industry, and related topics such as training. In particular, articles on *public* health and safety (e.g., vector control) and on *hazardous waste* are not included unless they include material on occupational safety or safe working procedures.

The references are divided into two sets: 1) those with known authors which are listed alphabetically by author; and 2) those whose authors are anonymous, which are listed alphabetically by title.

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